

Wildcat Wind Farm I, LLC

**Acoustical Analysis Report
Wildcat Wind Farm
Madison County, Indiana**

CO001397.0003

July 18, 2011 - DRAFT

ARCADIS



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Wildcat Wind Farm – Phase I
Madison County, Indiana

Acoustical Analysis Report

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Our Ref.:
CO001397.0003

Date:
DRAFT - July 18, 2011

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Table of Contents

1. Introduction	1
2. Regulatory Noise Code: Madison County Land Use and Development Code	3
3. Project Description	3
4. Meteorological Conditions	4
5. Wind Turbine Noise Calculation Methodology	4
6. Calculated Noise Impacts	5
6.1 GE 1.6xle Wind Turbine Noise Emission Specifications	5
6.2 Noise Impact Results	5
6.3 Conclusion	13
7. References	13
 Table 1 Madison County Noise Limit Regulations (dB)	3
Table 2 Average Meteorological Conditions	4
Table 3 GE 1.6xle Wind Turbine Noise Impact to Residential Receptors in the Winter Conditions	6
Figure 1 Potential Turbine Locations and Residential Receptors	2

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Table of Contents

Appendices

- A. Relevant Excerpts from the Madison County Land Use and Development Code
- B. Receiver Coordinate Locations
- C. Wind Turbine Coordinate Locations
- D. Cadna Noise Model Data and Results
- E. Qualifications of ARCADIS Noise Professionals

1. Introduction

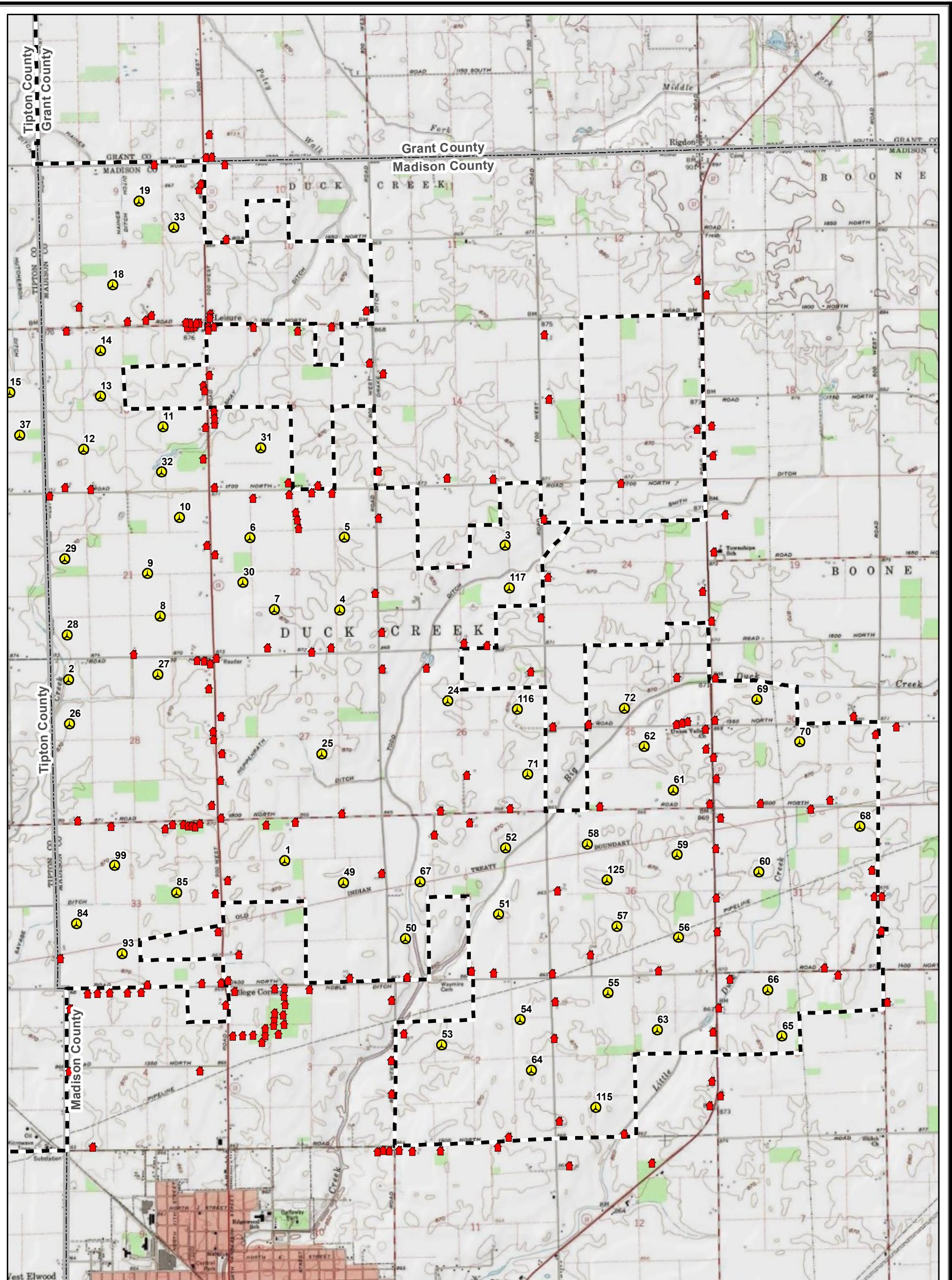
At the request of Wildcat Wind Farm I, LLC, ARCADIS U.S., Inc. (ARCADIS) has prepared this acoustical analysis report for the proposed project known as the Wildcat Wind Farm – Phase I, which is located within Madison County and Tipton County, Indiana. The proposed project consists of the new construction of approximately 200 megawatts (MW) of wind turbines on approximately 22,400 acres. A total of 127 potential locations for the GE 1.6xle wind turbines have been modeled in this analysis. The Wildcat Wind Farm – Phase I project will be located on leased agricultural land that includes 215 residences in the vicinity of the proposed wind farm within Madison County. For the purposes of this study, each residence has been considered a potential noise receptor location. Potential turbine locations and the 215 residential receptors within Madison County are shown in Figure 1.

Noise impacts from the proposed wind farm configuration have been predicted for receptors within Madison County for two separate scenarios using summer and winter weather conditions. All predicted noise impacts are based on the industry-accepted CONCAWE modeling algorithm using relevant meteorological conditions and the International Standards Organization (ISO) 9613 standard. The algorithm takes into account the effects of temperature, humidity, wind speed, wind direction, ground absorption, along with reflection and diffraction of topographic features.

The turbines will utilize leased property on which existing land uses will continue. An assessment of projected sound levels from the proposed wind farm facility was conducted to confirm compliance with the Madison County octave band noise threshold limits. Our calculations indicated that noise from all 127 potential turbine locations will be in compliance with noise level limits for all octave bands at each of the 215 residential receptors within Madison County.

The following sections provide details regarding the regulatory framework, methodology, project sound levels, and modeled impacts in order to demonstrate compliance with applicable standards.

Figure 1 Potential Turbine Locations and Residential Receptors



Legend

- Wildcat I GE16 100 100m 7/13/2011
- Madison County Receptor Location
- Wildcat I Project Boundary 4/8/2011



0 2,500 5,000
Feet
0 0.25 0.5 1
Miles



 ARCADIS

WILDCAT WIND FARM
PHASE I

POTENTIAL TURBINE
LOCATIONS AND
RESIDENTIAL RECEPTEORS

FIGURE 1

2. Regulatory Noise Code: Madison County Land Use and Development Code

The acoustical analysis for the project considered the potential for project noise influence in comparison to specific regulatory standards. Madison County regulations are detailed in Ordinance No. 2002-BC-0-6, Article 15, Section J, Part 3, Noise and Vibration. The Madison County noise regulations for wind turbines state:

At no point within 200 feet of a primary residence may the sound pressure levels from a wind turbine exceed the following sound levels. Sound levels shall be measured with an octave band analyzer or sound level meter and associated filter manufactured in compliance with standards prescribed by the American National Standards Institute (ANSI). This standard shall supersede any noise standard(s) set forth in any other Madison County Ordinance.

Madison County sets octave band noise limits for evaluating predicted noise levels at a residence. Table 1 summarizes the applicable requirements for each octave band.

Table 1 Madison County Noise Limit Regulations (dB)

Octave Band Center Frequency (Hertz)							
63	125	250	500	1000	2000	4000	8000
75	70	65	59	53	48	44	41

Relevant excerpts from the Madison County Land Use and Development Code are provided in Appendix A.

3. Project Description

The project site is located in Madison and Tipton County, Indiana. Neighboring land use in the proximity of the proposed project is primarily agricultural, with residential land uses scattered throughout. A total of 215 residences are identified in the vicinity of the proposed wind farm located within Madison County. Detailed residential receptor locations within Madison County are provided in Appendix B: Receiver Coordinate Locations.

The proposed project consists of the new construction of 200 MW of wind turbines on approximately 22,400 acres. The elevation of the project site ranges from 822 feet at the southeastern corner to 906 feet at the northeastern corner of the property. The wind

turbines will be spaced in an array throughout the project site. Coordinates for the 127 potential GE 1.6xle wind turbine locations assessed are provided in Appendix C: Wind Turbine Coordinate Locations.

4. Meteorological Conditions

The acoustical analysis incorporated a long-term 5-year average of meteorological conditions for the summer and winter seasons. The meteorological conditions for each scenario are summarized in Table 2.

Table 2 Average Meteorological Conditions

Scenario	Temperature (°C)	Relative Humidity (%)	Wind Speed (meters/second)
Summer	22	67	10
Winter	-1	67	10

5. Wind Turbine Noise Calculation Methodology

Modeling of the wind turbine noise environment was conducted using CadnaA (Computer Aided Noise Abatement) Version 4.0, which is a model-based computer program developed by DataKustik for predicting environmental noise impacts in a wide variety of wind and weather conditions. CadnaA assists in the calculation, presentation, assessment, and mitigation of noise exposure. It allows for the input of project information such as noise source data, barriers, structures, source elevation height, weather conditions, effective ground absorption, and topography to create a detailed computer-aided design (CAD) model, and uses the most up-to-date calculation standards to predict the propagation of outdoor noise impacts.

The Cadna model incorporates the CONCAWE algorithm for calculating noise propagation in different meteorological conditions. The algorithms take into account the effects of temperature, humidity, wind speed, wind direction, and ground absorption, along with reflection and diffraction due to various topographic features.

In order to provide compliance assurance during the range of meteorological conditions, the model provides results for the range of different wind directions in order to illustrate the influence a particular wind direction may have on sound travel to receptor locations. For this project, compliance has been demonstrated in all conditions.

6. Calculated Noise Impacts

6.1 GE 1.6xle Wind Turbine Noise Emission Specifications

Noise emission data are often supplied per the industry standard format of “sound power,” which is the total acoustic power radiated from a given sound source as related to a reference power level of 10 picowatts. Sound power differs from sound pressure, which measures the fluctuations in air pressure caused by the presence of sound waves, and is generally the format that describes noise levels as heard by the receiver. Sound pressure is the actual noise experienced by a human or registered by a sound level instrument. When sound pressure is used to describe a noise source, it must specify the distance from the noise source to provide complete information. Sound power is a specialized analytical method to provide information without the distance requirement, but it may be used to calculate the sound pressure at any desired distance.

All noise level or sound level values presented herein are expressed in terms of decibel (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans.

Continuous time-averaged noise levels are expressed by the symbol L_{eq} , for a specified duration.

The wind turbines proposed for this project are the GE 1.6xle with a hub height of 100 meters. The sound power (Power Watt Level [PWL]) for these wind turbines was obtained from the manufacturer’s specification sheets and input into the Cadna model. However, the PWL data is considered a trade secret by GE; accordingly, it is not included in this report.

6.2 Noise Impact Results

According to the Madison County noise threshold limits, noise generated from the operation of a wind turbine system is regulated within octave bands from 63 Hertz to 8000 Hertz for a 24 hour period. This analysis determined that the winter nighttime conditions generated the maximum impact due to the higher average wind speeds and harder surface ground conditions.

Noise compliance was a key element in establishing the turbine layout. Calculations for the selected layout demonstrate that noise impacts from each of the potential wind turbine locations will comply with Madison County limits for all octave bands at each of the 215 residential receptors within Madison County.

Table 3 summarizes the noise impacts under winter conditions at the 215 receptor locations within Madison County. Additional information regarding the noise model

calculations is provided in Appendix D: Cadna Noise Model Data and Results. Noise impact results for the other, less restrictive summer condition is also provided in Appendix D.

Table 3 GE 1.6xle Wind Turbine Noise Impact to Residential Receptors in the Winter Conditions

Receptor	Sound Pressure Level (dB)							
	Octave Band Center Frequency (Hertz)							
	63	125	250	500	1000	2000	4000	8000
<i>Madison County Standard</i>	75	70	65	59	53	48	44	41
1	55.3	50.3	46.7	44.4	41.4	31.8	7.9	0.0
2	51.1	45.3	43.2	40.8	35.9	21.5	0.0	0.0
3	54.7	49.6	46.3	44	40.7	30.1	3.7	0.0
4	53.9	48.7	45.7	43.3	39.7	28.4	0.0	0.0
5	50.7	44.9	42.9	40.4	35.3	20.5	0.0	0.0
6	51.1	45.3	43.2	40.8	35.9	21.5	0.0	0.0
7	50.3	44.4	42.5	40	34.7	19.5	0.0	0.0
8	57.1	52	48.4	46	42.9	32.9	8.5	0.0
9	55.9	50.5	47.5	45.1	40.9	29.3	1.2	0.0
10	56.4	51	47.9	45.5	41.5	30.3	2.7	0.0
11	57.9	52.8	49.2	46.8	43.7	34.3	10.7	0.0
12	53.3	47.8	45.2	42.8	38.4	26.5	0.0	0.0
13	52.7	46.7	45	42.3	35.8	17.8	0.0	0.0
14	50.8	46.6	45.2	42.5	35.7	17	0.0	0.0
15	53.5	47.7	45.9	43.1	37.1	19.5	0.0	0.0
16	53.8	47.9	46.1	43.3	37.5	20	0.0	0.0
17	53.9	48	46.1	43.4	37.7	20.7	0.0	0.0
18	53.3	47.4	45.7	42.9	36.7	18.7	0.0	0.0
19	53.4	47.6	45.8	43	37	19.2	0.0	0.0
20	53.6	47.8	46	43.2	37.5	20.2	0.0	0.0
21	53.2	48	46.2	43.4	37.8	21.1	0.0	0.0
22	52.7	46.7	45	42.3	35.5	16.4	0.0	0.0
23	52.9	46.9	45.2	42.5	35.9	17.3	0.0	0.0
24	40.5	34.4	32.8	29.8	20.9	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Receptor	Sound Pressure Level (dB)							
	Octave Band Center Frequency (Hertz)							
	63	125	250	500	1000	2000	4000	8000
<i>Madison County Standard</i>	75	70	65	59	53	48	44	41
27	57.2	51.8	48.6	46.2	42.4	32.0	8.1	0.0
28	54.2	48.3	46.3	43.6	37.7	22.3	0.0	0.0
29	55.1	49.4	47.1	44.4	39.1	25.6	0.0	0.0
30	50.5	44.4	42.7	39.8	32.0	9.8	0.0	0.0
31	52.9	46.9	45.2	42.6	35.9	17.2	0.0	0.0
32	45.5	39.4	37.9	34.9	26.4	2.9	0.0	0.0
33	48.7	42.6	41.1	38.1	29.9	7.7	0.0	0.0
34	55.5	49.8	47.1	44.6	39.7	27.2	0.0	0.0
35	55.4	49.7	47.3	44.7	39.8	26.8	0.0	0.0
36	56.9	51.6	48.5	45.9	41.9	31.1	5.7	0.0
37	56.6	51.3	48.5	45.9	42.1	29.9	1.1	0.0
38	56.1	50.8	48.0	45.4	41.6	29.1	0.0	0.0
39	56.9	51.4	48.2	45.7	41.5	30.7	5.9	0.0
40	55.8	50.3	47.6	44.9	40.3	26.9	0.0	0.0
41	56.3	50.6	47.3	44.7	39.2	25.3	0.0	0.0
42	57.6	52.4	49.1	46.6	42.9	32.2	5.9	0.0
43	57.2	51.8	48.6	46.1	42.0	30.9	3.8	0.0
44	57.1	51.8	48.4	45.9	42.2	31.7	7.7	0.0
45	56.1	50.8	47.8	45.4	41.3	30.4	4.6	0.0
46	55.2	49.8	46.9	44.4	40.2	29.3	3.4	0.0
47	56.3	50.8	47.9	45.5	41.4	29.8	1.0	0.0
48	55.9	50.5	47.7	45.2	40.9	28.7	0.0	0.0
49	55.1	49.5	46.8	44.3	39.5	26.9	0.0	0.0
50	54.4	48.8	46.2	43.6	38.7	25.7	0.0	0.0
51	58.3	53.2	49.2	46.8	43.9	34.7	11.3	0.0
52	57.9	52.7	49.0	46.5	42.6	32.4	8.2	0.0
53	56.3	50.9	47.9	45.3	40.9	29.0	1.0	0.0
54	56.7	51.3	48.3	45.9	42.1	30.8	3.2	0.0
55	44.6	38.5	37.0	34.1	26.1	3.4	0.0	0.0
56	44.5	38.5	36.9	34.0	25.9	2.7	0.0	0.0
57	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	43.7	37.6	36.1	33.1	24.5	0.0	0.0	0.0

Receptor	Sound Pressure Level (dB)							
	Octave Band Center Frequency (Hertz)							
	63	125	250	500	1000	2000	4000	8000
<i>Madison County Standard</i>	75	70	65	59	53	48	44	41
59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	50.2	44.2	42.5	39.9	33.7	16.7	0.0	0.0
62	51.9	45.9	43.9	41.3	35.2	20.0	0.0	0.0
63	51.1	45.4	43.2	40.7	35.7	22.2	0.0	0.0
64	55.5	50.4	47.1	44.6	41.1	31.4	8.0	0.0
65	53.7	48.6	45.4	43.0	39.7	29.0	2.5	0.0
66	45.3	39.3	37.8	35.0	27.4	5.7	0.0	0.0
67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	43.9	37.8	36.3	33.3	24.8	0.3	0.0	0.0
69	39.8	33.7	32.1	28.9	19.5	0.0	0.0	0.0
70	58.2	53.3	49.3	46.8	44.2	35.6	14.1	0.0
71	56.7	51.4	48.2	45.7	42.0	31.6	6.4	0.0
72	56.0	50.6	47.6	45.0	40.9	29.5	2.0	0.0
73	55.4	49.8	47.0	44.4	39.9	27.6	0.0	0.0
74	55.2	49.5	45.9	43.2	37.7	25.1	0.0	0.0
75	54.7	49.1	46.4	43.8	39.0	26.9	0.0	0.0
76	55.0	49.3	46.6	44.0	39.1	25.9	0.0	0.0
77	54.5	48.8	45.7	43.1	38.2	26.0	0.0	0.0
78	54.9	49.3	45.6	42.9	37.5	25.2	0.0	0.0
79	53.9	48.4	45.8	43.3	38.4	25.5	0.0	0.0
80	55.5	50.5	47.1	44.7	41.3	31.5	7.9	0.0
81	53.8	48.1	45.8	43.2	38.2	24.5	0.0	0.0
82	52.6	46.6	44.4	41.6	35.1	18.9	0.0	0.0
83	52.2	46.2	44.1	41.2	34.5	17.2	0.0	0.0
84	52.9	46.9	44.7	41.9	35.5	19.8	0.0	0.0
85	51.7	45.5	43.5	40.6	33.0	13.5	0.0	0.0
86	53.6	47.8	45.6	43.0	37.8	23.5	0.0	0.0
87	53.6	47.8	45.5	43.0	37.7	23.5	0.0	0.0
88	53.5	47.7	45.5	42.9	37.6	23.2	0.0	0.0
89	53.3	47.5	45.3	42.8	37.5	23.1	0.0	0.0
90	55.2	50.1	46.7	44.3	40.8	31.1	7.2	0.0

Receptor	Sound Pressure Level (dB)							
	Octave Band Center Frequency (Hertz)							
	63	125	250	500	1000	2000	4000	8000
<i>Madison County Standard</i>	75	70	65	59	53	48	44	41
91	52.7	46.7	44.7	42.1	36.5	21.2	0.0	0.0
92	51.7	46.0	44.0	41.4	35.1	18.2	0.0	0.0
93	50.5	44.8	42.5	39.6	33.0	14.9	0.0	0.0
94	53.1	47.2	45.1	42.5	37.1	22.1	0.0	0.0
95	53.8	48.3	45.7	43.2	38.1	24.3	0.0	0.0
96	55.4	50.4	46.9	44.5	41.2	31.4	7.6	0.0
97	54.6	49.2	46.2	43.7	39.6	28.5	2.0	0.0
98	56.2	51.0	47.7	45.3	41.9	31.9	8.0	0.0
99	55.1	49.9	46.7	44.3	40.8	30.3	5.2	0.0
100	55.8	50.9	47.2	44.9	42.0	32.4	7.9	0.0
101	52.8	46.9	44.5	41.8	36.2	21.3	0.0	0.0
102	55.4	50.3	46.9	44.4	41.0	31.4	7.9	0.0
103	53.6	47.7	45.0	42.5	37.3	23.2	0.0	0.0
104	54.3	48.7	46.0	43.4	38.9	25.8	0.0	0.0
105	56.0	50.8	47.5	45.1	41.4	31.4	7.6	0.0
106	49.0	42.8	41.1	38.2	30.4	8.9	0.0	0.0
107	50.4	44.4	42.7	40.1	33.6	16.1	0.0	0.0
108	54.5	48.9	46.6	44.1	39.4	25.7	0.0	0.0
109	54.9	49.6	46.9	44.4	40.2	29.0	2.8	0.0
110	56.6	51.5	47.9	45.5	42.3	32.4	7.9	0.0
111	54.1	48.3	46.0	43.4	37.9	23.2	0.0	0.0
112	55.0	49.2	46.6	44.1	39.1	25.7	0.0	0.0
113	56.9	51.8	48.0	45.4	41.6	31.8	8.1	0.0
114	56.2	50.8	47.8	45.2	41.2	30.3	5.0	0.0
115	56.7	51.5	47.8	45.4	42.2	32.4	8.6	0.0
116	54.6	49.2	45.6	43.1	39.6	29.0	2.8	0.0
117	55.7	50.4	47.3	44.8	41.1	29.2	0.6	0.0
118	56.2	51.0	47.7	45.2	41.9	31.0	4.6	0.0
119	56.7	51.5	47.8	45.4	42.4	32.6	8.3	0.0
120	55.4	50.1	47.3	44.8	40.2	28.1	0.0	0.0
121	55.8	50.4	47.5	45.0	40.7	28.7	0.0	0.0
122	55.0	49.3	46.6	44.0	39.3	26.1	0.0	0.0

Receptor	Sound Pressure Level (dB)							
	Octave Band Center Frequency (Hertz)							
	63	125	250	500	1000	2000	4000	8000
<i>Madison County Standard</i>	75	70	65	59	53	48	44	41
123	57.1	51.7	48.4	45.9	42.0	31.8	7.8	0.0
124	55.4	49.9	46.4	43.8	38.6	26.2	0.0	0.0
125	56.0	50.6	47.6	45.1	41.0	30.0	4.2	0.0
126	56.0	50.5	47.6	45.2	40.7	28.7	0.0	0.0
127	54.3	48.7	46.2	43.6	39.1	26.1	0.0	0.0
128	53.6	48.2	44.9	42.4	38.2	26.8	0.0	0.0
129	55.1	50.0	46.4	44.0	40.9	31.4	8.0	0.0
130	53.0	47.4	44.8	42.3	37.8	25.4	0.0	0.0
131	56.0	50.9	47.3	44.9	41.9	32.3	8.7	0.0
132	51.5	45.8	43.4	40.6	36.0	20.9	0.0	0.0
133	54.7	49.8	46.2	43.8	40.8	31.2	7.5	0.0
134	54.3	49.2	45.9	43.4	40.1	30.0	5.2	0.0
135	53.8	49.1	45.7	43.1	41.0	29.9	5.7	0.0
136	54.3	49.2	45.2	42.9	40.2	30.8	6.9	0.0
137	53.8	48.6	44.9	42.5	39.2	28.9	2.9	0.0
138	53.1	47.7	44.2	41.8	38.0	26.8	0.0	0.0
139	49.6	43.2	41.0	38.2	31.1	11.8	0.0	0.0
140	48.2	41.9	39.9	37.2	30.7	11.8	0.0	0.0
141	49.0	42.8	41.0	38.2	30.9	10.9	0.0	0.0
142	50.7	44.9	42.9	40.2	34.9	18.3	0.0	0.0
143	50.2	44.1	42.2	39.6	33.1	15.3	0.0	0.0
144	49.4	43.4	41.5	38.5	31.2	9.5	0.0	0.0
145	49.2	43.1	41.2	38.4	31.2	11.5	0.0	0.0
146	50.0	43.9	42.0	39.3	32.6	14.4	0.0	0.0
147	50.6	44.6	42.4	39.7	33.5	16.7	0.0	0.0
148	52.8	46.9	44.6	42.0	36.4	22.2	0.0	0.0
149	49.0	42.7	40.8	37.9	30.3	8.8	0.0	0.0
150	48.8	42.5	40.6	37.6	29.9	7.6	0.0	0.0
151	50.3	44.2	42.3	39.6	32.6	13.5	0.0	0.0
152	49.4	43.0	41.1	38.2	30.9	10.2	0.0	0.0
153	46.6	40.6	38.7	35.3	26.4	0.0	0.0	0.0
154	46.9	40.9	39.0	35.7	27.0	0.7	0.0	0.0

Receptor	Sound Pressure Level (dB)							
	Octave Band Center Frequency (Hertz)							
	63	125	250	500	1000	2000	4000	8000
<i>Madison County Standard</i>	75	70	65	59	53	48	44	41
155	46.6	40.6	38.6	35.2	26.3	0.0	0.0	0.0
156	46.8	40.5	38.4	35.4	27.0	3.2	0.0	0.0
157	46.9	40.7	38.7	35.8	27.6	4.7	0.0	0.0
158	47.1	41.1	39.2	35.9	27.4	1.7	0.0	0.0
159	45.8	39.4	36.8	33.7	25.0	0.2	0.0	0.0
160	48.2	42.2	40.4	37.2	29.0	4.5	0.0	0.0
161	47.9	42.4	40.6	37.5	29.3	5.3	0.0	0.0
162	45.5	39.6	38.0	34.8	26.7	3.1	0.0	0.0
163	48.4	42.1	40.2	37.2	29.1	5.9	0.0	0.0
164	48.1	41.8	39.9	36.8	28.6	4.7	0.0	0.0
165	45.8	39.2	36.7	33.4	24.6	0.0	0.0	0.0
166	56.7	51.6	47.7	45.2	41.7	32.2	8.4	0.0
167	55.4	50.2	47.4	44.8	40.7	28.6	0.9	0.0
168	56.0	50.4	47.0	44.4	39.3	26.5	0.0	0.0
169	57.2	51.9	48.5	46.0	42.1	31.9	8.0	0.0
170	56.5	51.2	48.0	45.5	41.7	31.6	7.9	0.0
171	56.3	50.8	47.9	45.4	40.8	28.8	0.0	0.0
172	54.6	49.0	45.4	42.8	37.3	24.5	0.0	0.0
173	53.6	48.2	45.7	43.1	38.9	25.0	0.0	0.0
174	56.6	51.3	47.5	45.1	41.8	31.9	8.0	0.0
175	55.1	49.4	46.8	44.2	39.1	25.7	0.0	0.0
176	55.8	50.4	47.8	45.1	40.9	28.2	0.0	0.0
177	55.8	50.2	47.1	44.7	40.4	28.3	0.0	0.0
178	54.6	49.9	46.4	43.8	40.7	31.5	8.2	0.0
179	53.1	47.8	45.0	42.4	38.2	26.7	0.0	0.0
180	57.5	52.6	48.5	46.2	43.5	34.4	11.1	0.0
181	58.2	53.1	49.5	47.1	44.0	34.3	10.6	0.0
182	56.7	51.3	47.7	45.2	40.8	29.2	0.1	0.0
183	55.7	50.6	46.7	44.2	41.3	31.7	8.1	0.0
184	54.6	49.0	46.2	43.6	38.5	26.0	0.0	0.0
185	54.7	49.0	46.2	43.6	38.1	24.6	0.0	0.0
186	45.0	38.9	37.2	34.3	26.3	3.5	0.0	0.0

Receptor	Sound Pressure Level (dB)							
	Octave Band Center Frequency (Hertz)							
	63	125	250	500	1000	2000	4000	8000
<i>Madison County Standard</i>	75	70	65	59	53	48	44	41
187	50.7	45.1	42.9	40.3	35.2	21.3	0.0	0.0
188	55.0	50.0	45.9	43.5	40.7	31.7	8.6	0.0
189	47.8	41.9	40.3	37.2	30.5	9.6	0.0	0.0
190	47.8	41.7	40.1	37.3	29.8	9.7	0.0	0.0
191	48.4	41.9	40.1	37.2	30.3	10.5	0.0	0.0
192	45.3	40.7	39.1	36.3	28.7	8.3	0.0	0.0
193	46.5	40.5	38.9	36.1	28.5	7.8	0.0	0.0
194	46.3	40.2	38.6	35.8	28.0	6.8	0.0	0.0
195	52.1	46.4	44.1	41.6	36.5	22.1	0.0	0.0
196	50.9	45.0	43.0	40.3	34.5	18.3	0.0	0.0
197	51.0	45.0	42.8	40.0	33.3	16.0	0.0	0.0
198	52.2	46.4	44.1	41.4	35.4	20.2	0.0	0.0
199	49.3	43.0	40.4	37.6	31.2	13.8	0.0	0.0
200	54.9	49.9	46.1	43.7	40.8	31.5	8.3	0.0
201	50.9	45.3	42.5	40.0	35.6	23.0	0.0	0.0
202	50.1	44.1	42.0	39.3	33.7	18.6	0.0	0.0
203	50.9	45.2	43.2	40.6	35.6	20.3	0.0	0.0
204	52.2	46.6	43.9	41.5	37.0	24.5	0.0	0.0
205	49.7	43.7	42.0	39.4	33.0	15.4	0.0	0.0
206	54.1	48.6	45.5	43.1	39.0	27.5	0.0	0.0
207	54.0	47.7	45.2	42.5	36.5	21.0	0.0	0.0
208	55.0	49.9	46.0	43.6	40.7	31.5	8.1	0.0
209	52.8	47.9	44.9	42.2	39.4	27.6	1.3	0.0
210	49.4	43.5	41.9	39.0	32.4	12.1	0.0	0.0
211	50.8	45.5	43.6	40.7	35.6	19.6	0.0	0.0
212	51.0	45.2	43.2	40.6	35.0	20.3	0.0	0.0
213	53.4	47.7	45.3	42.9	38.1	25.0	0.0	0.0
214	52.4	46.6	44.5	42.0	36.7	22.2	0.0	0.0
215	48.5	42.6	41.0	38.1	31.2	11.8	0.0	0.0

6.3 Conclusion

Based on the results as presented above, the proposed project layout will achieve compliance with the Madison County noise level standards at each of the 215 residential receptors within Madison County for noise sources at each of the 127 potential wind turbine locations. Such compliance will be achieved in both summer and winter conditions. Accordingly, the proposed project meets the relevant requirements of the Madison County Land Use and Development Code.

7. References

- Beranek, Leo L. 1988. *Noise and Vibration Control*, Revised Edition. INCE.
- Harris, Cyril M. 1998. *Handbook of Acoustical Measurements and Noise Control*, 3rd Edition. Acoustical Society of America.
- IEC 61400-11. 2002. *Wind Turbine Generator Systems - Part 11: Acoustical Noise Measurement Techniques*, Second Edition.
- International Standard (ISO) 9613.1996. *Acoustics – Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation*.
- Manning, C.J. 1981. CONCAWE Report No. 4/81: "The propagation of noise from petroleum and petrochemical complexes to neighboring communities."
- Raichel, Daniel R. 2000. *The Science and Applications of Acoustics*.
- Madison County. 2011. Ordinance Number 2002-BC-0-6, Article 15, Section J, Part 3,"Noise and Vibration."

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Appendix A

Relevant Excerpts from the Madison
County Land Use and Development
Code

b. Strobe Lights

Red strobe lights shall be required for night-time illumination to reduce harm to migrating birds. Red pulsating incandescent lights are expressly prohibited.

c. Shielding

Except with respect to lighting required by the FAA, All lighting shall be shielded so that no glare extends substantially beyond the boundaries of any WECS.

10. Materials Handling, Storage and Disposal

a. Solid Wastes

All solid wastes whether generated from supplies, equipment, parts, packaging, operation or maintenance of the facility, including old parts and equipment related to the construction, operation and/or maintenance of any WECS shall be removed from the site promptly and disposed of in accordance with all federal, state, and local laws.

b. Hazardous Materials

All hazardous materials or waste related to the construction, operation and/or maintenance of any WECS shall be handled, stored, transported and disposed of in accordance with all applicable local, state and federal laws.

J. OTHER APPLICABLE STANDARDS

1. Guyed Wire Anchors

No guyed wire anchors shall be allowed within any required road right-of-way setback.

2. Sewer and Water

All WECS facilities shall comply with the existing septic and well regulation as required by the Madison County Health Department and/or the State of Indiana Department of Public Health.

3. Noise and Vibration

At no point within 200 feet of a primary residence may the sound pressure levels from a wind turbine exceed the following sound levels. Sound levels shall be measured with an octave band analyzer or sound level meter and associated filter manufactured in compliance with standards prescribed by the American National Standards Institute (ANSI). This standard shall supersede any noise standard(s) set forth in any other Madison County Ordinance.

Octave Bands for Madison County In Hertz (Hz), per ANSI	Maximum Permitted Sound Level (in decibels) (Measured 200 feet from edge of any Primary Structure.)
63	75
125	70
250	65
500	59
1000	53
2000	48
4000	44
8000	41

4. Utility Interconnection

The WECS, if interconnected to a utility system, shall meet the requirements for interconnection and operate as prescribed by the applicable regulations of the electrical utility, as amended from time to time.

5. Signage

- a. In addition to complying with Sign standards, the following signage regulations and standards shall also apply. In the event that one of the following regulations or standards conflicts with another sign regulation or standard prescribed by the Madison County Land Use & Development Code, the most restrictive regulation or standard shall apply.

1. Surface Area

No sign shall exceed sixteen (16) square feet in surface area.

2. Height

No sign shall exceed eight (8) feet in height.

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Appendix B

Receiver Coordinate Locations

Client:	Wildcat Wind Farm, LLC
Project Name:	WildCat Wind Farm
Project Number:	CO001397.0003
Project Location:	Madison County, IN
Date:	7/14/2011

Receiver Coordinate Locations			
Receiver Number	Coordinates		
	X (m)	Y (m)	Z (m)
1	597718.37	4470159.43	869.55
2	598255.61	4470457.17	865.34
3	598154.62	4469917.37	869.19
4	598173.93	4469973.61	869.25
5	598278.67	4470233.10	867.52
6	598226.08	4470230.03	868.49
7	598406.36	4470160.92	867.52
8	596985.17	4468767.06	869.52
9	597689.67	4468683.29	871.52
10	597636.76	4468638.53	871.96
11	597458.25	4468625.78	871.42
12	598420.67	4469429.78	872.52
13	598264.18	4468699.45	874.46
14	598263.31	4468663.26	873.43
15	598109.74	4468575.49	873.52
16	598071.45	4468572.31	873.28
17	598039.83	4468572.57	872.57
18	598154.32	4468613.59	873.52
19	598126.07	4468613.23	873.48
20	598068.21	4468613.81	872.26
21	598027.17	4468614.61	871.79
22	598296.49	4468577.26	870.52
23	598246.90	4468574.97	871.62
24	599793.09	4468731.19	869.56
25	603118.96	4468887.60	883.95
26	603034.02	4469031.59	887.34
27	596859.67	4468534.37	871.19
28	598256.72	4468102.17	870.52
29	598199.15	4468000.83	871.52

30	598688.30	4468569.00	869.52
31	598247.99	4468542.16	871.52
32	599450.44	4468576.57	870.43
33	599121.25	4468535.84	868.94
34	598305.07	4467747.85	871.52
35	598213.18	4467950.54	871.52
36	598218.37	4467589.99	871.82
37	598305.87	4467622.36	872.52
38	598307.58	4467679.85	871.52
39	596844.29	4467004.82	873.40
40	596694.36	4466920.36	873.30
41	597097.41	4466984.19	872.52
42	598197.20	4467284.42	873.52
43	598308.41	4467003.59	874.52
44	598683.23	4466899.00	874.85
45	599028.01	4467051.15	875.16
46	599458.31	4466948.44	875.52
47	599102.01	4466759.22	876.26
48	599036.26	4466935.72	874.46
49	599260.78	4466953.68	875.37
50	599317.44	4467021.42	876.18
51	598311.59	4466345.07	871.26
52	598234.53	4466436.86	872.58
53	599128.62	4466602.48	877.06
54	599116.00	4466683.80	876.42
55	599823.53	4468223.54	869.52
56	599957.00	4468116.78	871.52
57	601534.66	4468496.09	877.52
58	601579.83	4467866.53	872.71
59	603027.09	4467575.25	874.14
60	603171.78	4467604.28	875.42
61	600581.20	4467094.66	874.69
62	599912.97	4467163.46	874.17
63	601033.40	4467084.65	872.20
64	599914.08	4466701.98	875.17
65	601529.54	4466694.29	871.44
66	602282.82	4467045.91	873.68
67	603186.20	4467315.95	874.52
68	603195.35	4466371.37	873.44
69	603302.85	4466734.94	873.64

70	597516.92	4465372.64	871.52
71	598138.42	4465313.23	871.68
72	598205.01	4465307.99	871.52
73	598267.15	4465280.06	872.52
74	598825.91	4465436.46	872.54
75	598254.39	4465033.98	873.52
76	598327.91	4465333.64	872.78
77	599260.61	4465394.57	873.52
78	599448.24	4465436.24	869.52
79	596970.81	4463742.78	873.03
80	597295.27	4463690.30	872.28
81	597899.55	4463704.80	873.52
82	598292.18	4464619.26	874.44
83	598297.16	4464537.62	874.44
84	598373.97	4464764.32	873.76
85	598379.22	4464403.32	872.52
86	598002.79	4463704.93	872.49
87	598051.33	4463691.02	872.09
88	598084.79	4463692.01	872.52
89	598120.66	4463685.37	872.52
90	598814.01	4463703.78	869.35
91	598370.73	4463771.57	870.46
92	598281.61	4463893.63	870.91
93	598368.62	4464140.68	870.85
94	598163.18	4463713.94	872.01
95	599554.29	4463811.56	867.19
96	599096.33	4463728.58	867.86
97	599943.66	4465589.02	870.52
98	599880.35	4465967.41	872.52
99	601502.19	4465731.77	872.52
100	601569.39	4466126.18	868.28
101	599946.93	4465228.14	867.51
102	600378.78	4465238.35	866.99
103	600748.90	4465481.08	867.52
104	600975.48	4465457.26	867.62
105	601400.26	4465202.88	872.78
106	603082.53	4465987.33	871.24
107	603173.35	4465697.78	870.95
108	602831.75	4465144.04	870.93
109	603206.71	4465141.70	866.52

110	601618.66	4464661.78	869.87
111	600517.42	4463838.47	869.11
112	600775.97	4464190.86	869.52
113	601197.97	4463861.70	870.56
114	600805.50	4463725.20	870.52
115	601969.02	4464686.21	870.52
116	603203.92	4464728.04	870.52
117	602935.41	4464715.69	869.52
118	602880.93	4464698.63	868.90
119	602827.97	4464687.25	868.76
120	603189.52	4464365.92	871.95
121	603113.86	4464449.14	870.52
122	603111.36	4464639.22	869.63
123	602078.40	4463883.14	865.52
124	603152.97	4463908.24	871.18
125	603216.57	4464159.35	871.07
126	603259.98	4463770.04	870.29
127	597826.88	4463665.68	872.52
128	598436.45	4463157.83	872.31
129	598317.94	4463031.39	871.82
130	598342.72	4462660.39	867.52
131	596797.98	4462395.44	869.52
132	596898.14	4461903.18	868.52
133	597650.90	4462139.57	870.98
134	597591.10	4462064.00	869.19
135	597456.59	4462062.26	868.82
136	597280.17	4462062.95	870.52
137	597163.62	4462058.47	869.83
138	597065.02	4462054.22	869.62
139	596920.55	4461517.85	869.52
140	596885.31	4461294.07	868.29
141	598419.72	4461941.88	870.52
142	598185.34	4462153.41	870.52
143	598370.79	4462156.68	870.69
144	598897.13	4462104.87	867.52
145	598502.89	4462072.90	870.31
146	598438.71	4462179.26	870.85
147	598546.00	4462433.77	867.71
148	599631.69	4462202.17	869.45
149	598985.98	4462028.62	866.52

150	598996.04	4461945.37	867.30
151	599235.16	4462091.45	867.27
152	598992.78	4462106.13	867.08
153	598770.68	4461579.13	868.31
154	598802.70	4461645.06	868.04
155	598683.10	4461646.47	869.52
156	598584.51	4461642.20	868.87
157	598488.91	4461637.97	869.52
158	598801.80	4461713.54	868.21
159	598888.08	4461744.45	867.52
160	598893.20	4461810.02	868.52
161	598895.49	4461863.65	868.35
162	598164.47	4461300.23	868.42
163	598979.40	4461846.89	869.52
164	598986.63	4461751.70	868.52
165	598934.05	4461658.70	867.52
166	599942.50	4463227.32	865.50
167	600458.76	4463605.43	870.96
168	601663.74	4463056.54	866.37
169	603210.94	4463473.62	873.52
170	603226.17	4462660.71	870.39
171	603216.90	4462989.32	870.26
172	600193.94	4462214.85	864.52
173	600039.58	4461987.45	864.54
174	601641.23	4461973.03	871.52
175	600820.36	4462273.17	867.92
176	601036.48	4462256.09	868.02
177	601614.02	4462251.32	867.52
178	600161.21	4461659.88	861.69
179	600034.36	4461397.79	860.35
180	601631.95	4461616.20	870.94
181	601986.83	4462432.32	871.95
182	602650.69	4462279.48	872.20
183	603349.94	4462195.02	867.52
184	603184.85	4461681.85	868.84
185	603241.68	4461913.54	868.52
186	597119.07	4460553.42	873.52
187	600041.95	4461071.84	860.98
188	601682.54	4460806.51	871.52
189	600241.67	4460512.45	866.52

190	600115.57	4460518.96	865.52
191	600518.53	4460514.80	866.52
192	600017.97	4460514.69	864.38
193	599956.60	4460521.32	862.52
194	599900.69	4460509.41	861.52
195	601187.35	4460650.12	873.52
196	601077.35	4460552.66	871.20
197	603258.47	4461054.97	873.52
198	603174.87	4461197.50	873.45
199	603154.98	4460959.01	874.33
200	602317.44	4460682.28	863.52
201	601777.96	4460367.79	873.29
202	602585.63	4460395.87	867.62
203	604773.65	4464588.98	871.52
204	604559.88	4464763.75	870.52
205	604977.39	4464663.25	871.52
206	604141.32	4463856.47	869.29
207	603648.66	4463913.94	870.34
208	604331.56	4463943.82	869.70
209	604739.98	4463260.83	873.95
210	604829.40	4462668.12	877.31
211	604760.48	4463002.76	875.97
212	604836.82	4463004.16	875.52
213	604274.05	4462306.14	873.59
214	604407.42	4462237.59	876.80
215	604890.71	4461968.64	877.99

Appendix C

Wind Turbine Coordinate Locations

Client:	Wildcat Wind Farm, LLC
Project Name:	WildCat Wind Farm
Project Number:	CO001397.0003
Project Location:	Madison County, IN
Date:	7/14/2011

Turbine Coordinate Locations			
Receiver Number	Coordinates		
	X (m)	Y (m)	Z (m)
1	603858.00	4461637.00	971.27
2	598994.00	4463352.00	967.00
3	596877.00	4465125.00	967.12
4	601149.00	4466436.00	966.00
5	599530.00	4465804.00	968.66
6	599576.00	4466517.00	972.00
7	598652.00	4466510.00	970.82
8	598892.00	4465808.00	970.55
9	597774.00	4465743.00	970.31
10	597649.00	4466160.00	972.98
11	597962.00	4466708.00	969.91
12	597801.00	4467596.00	970.21
13	597023.00	4467377.00	972.00
14	597190.00	4467895.00	967.91
15	597191.00	4468341.00	968.00
16	596303.00	4467933.00	969.34
17	596026.00	4468244.00	968.00
18	594446.00	4467612.00	971.00
19	597310.00	4468985.00	969.00
20	597566.00	4469804.00	966.70
21	594934.00	4470697.00	964.00
22	594691.00	4471017.00	962.87
23	596246.00	4472351.00	962.17
24	595576.00	4472292.00	961.00
25	600588.00	4464916.00	970.00
26	599354.00	4464398.00	968.16
27	596885.00	4464692.00	969.07
28	597752.00	4465174.00	969.74
29	596864.00	4465560.00	968.94

30	596842.00	4466305.00	967.21
31	598584.00	4466075.00	969.00
32	598756.00	4467388.00	972.05
33	597787.00	4467153.00	970.00
34	597907.00	4469544.00	968.00
35	595568.00	4469155.00	967.00
36	594841.00	4468195.00	965.61
37	595598.00	4467503.00	971.10
38	596400.00	4467515.00	971.00
39	595994.00	4470652.00	966.67
40	595608.00	4470862.00	965.00
41	594317.00	4471269.00	960.00
42	592445.00	4469179.00	962.91
43	592286.00	4469549.00	961.28
44	592072.00	4469879.00	960.00
45	592529.00	4470501.00	963.00
46	592370.00	4470853.00	960.00
47	591407.00	4470311.00	961.53
48	592272.00	4471297.00	960.96
49	596056.00	4466525.00	972.93
50	599568.00	4463139.00	966.31
51	600172.00	4462592.00	960.06
52	601085.00	4462830.00	967.46
53	601152.00	4463477.00	963.19
54	600526.00	4461550.00	960.41
55	601297.00	4461799.00	965.78
56	602153.00	4462059.00	968.00
57	602845.00	4462602.00	968.00
58	602241.00	4462711.00	971.00
59	601954.00	4463516.00	964.24
60	602830.00	4463411.00	969.00
61	603632.00	4463243.00	972.34
62	602796.00	4464042.00	966.29
63	602508.00	4464472.00	965.02
64	602636.00	4461697.00	965.52
65	601404.00	4461303.00	966.00
66	603717.00	4462090.00	970.16
67	600315.00	4463145.00	965.50
68	604618.00	4463689.00	967.20
69	603611.00	4464932.00	966.00
70	604029.00	4464514.00	969.00
71	601369.00	4464197.00	969.00

72	602314.00	4464842.00	968.13
73	592460.00	4460194.00	967.67
74	592974.00	4460769.00	966.48
75	592220.00	4460737.00	966.00
76	592446.00	4461683.00	971.00
77	593830.00	4461047.00	968.69
78	593892.00	4461529.00	969.34
79	594750.00	4461726.00	967.85
80	595791.00	4460839.00	964.45
81	592441.00	4462853.00	966.60
82	594290.00	4462267.00	974.00
83	595323.00	4462587.00	967.54
84	596957.00	4462737.00	965.00
85	597933.00	4463042.00	968.22
86	595896.00	4463878.00	971.62
87	592521.00	4459786.00	968.51
88	592988.00	4461482.00	967.70
89	593969.00	4460656.00	961.00
90	594087.00	4462769.00	971.38
91	595308.00	4463226.00	963.68
92	595859.00	4461658.00	964.50
93	597404.00	4462443.00	967.36
94	596136.00	4463270.00	967.09
95	592501.00	4462422.00	967.67
96	592211.00	4463266.00	970.43
97	594597.00	4464304.00	973.62
98	594821.00	4463884.00	970.46
99	597329.00	4463305.00	965.95
100	591506.00	4465410.00	964.49
101	590780.00	4465869.00	964.42
102	590420.00	4466101.00	964.11
103	591258.00	4467392.00	965.00
104	591109.00	4467762.00	967.14
105	591226.00	4468254.00	961.00
106	590403.00	4467818.00	963.00
107	590390.00	4469013.00	960.00
108	590664.00	4468663.00	963.00
109	591520.00	4469053.00	962.66
110	593905.00	4472886.00	962.27
111	595508.00	4473056.00	962.21
112	596008.00	4472807.00	963.00
113	593986.00	4468184.00	964.56

114	594708.00	4472303.00	965.49
115	602037.00	4460939.00	964.27
116	601268.00	4464835.00	969.27
117	601192.00	4466020.00	965.52
118	593861.00	4467100.00	969.00
119	591500.00	4465930.00	965.95
120	590744.00	4467137.00	964.00
121	593906.00	4472074.00	968.53
122	594655.00	4471845.00	963.00
123	596002.00	4468890.00	965.97
124	596155.00	4471883.00	964.00
125	602148.00	4463163.00	971.00
126	591600.00	4471247.00	956.56
127	594733.00	4461324.00	962.97

Appendix D

Cadna Noise Model Data and Results

Noise Impacts Under Average Winter Conditions								
Client:	Wildcat Wind Farm, LLC	Manufacture:	GE	Winter Temperature:	-1°C			
Project Name:	WildCat Wind Farm	Wind Turbine Model:	1.6xle	Winter Humidity:	67%			
Project Number:	CO001397.0003	Hub Height:	100 meters	Ground Absorption:	75%			
Project Location:	Madison County	Number of Blades:	3	Modeled Wind speed (m/s):	10 m/s			
Date:	7/14/2011	Number of Turbines:	127	Modeled Receiver Height:	1.52 m			
Madison County Noise Limits								
Frequency (Hz)		63	125	250	500	1000	2000	4000
Noise Limit Level (dB)		75	70	65	59	53	48	44
Worst-Case Wind Turbine Noise Impacts to Residential Receptor Points								
Receiver Number	Wind Direction	Sound Pressure Level (dB) Octave Bands (Hz)						
		63	125	250	500	1000	2000	4000
1	West (270°)	54.6	49.7	45.7	43.3	40.5	31.4	7.9
	South (180°)	55.3	50.3	46.7	44.4	41.4	31.8	7.9
	East (90°)	51.4	46.4	41.1	38.1	35.2	23.3	0.0
	North (0°)	35.5	50.2	45.1	33.5	26.0	20.2	0.0
2	West (270°)	48.8	43.2	41.5	38.9	32.9	16.0	0.0
	South (180°)	51.1	45.3	43.2	40.8	35.9	21.5	0.0
	East (90°)	42.7	36.5	29.7	25.3	16.5	3.9	0.0
	North (0°)	27.1	42.7	36.5	25.3	16.5	3.9	0.0
3	West (270°)	54.7	49.6	46.3	44.0	40.7	30.1	3.7
	South (180°)	54.2	49.3	45.9	43.5	40.7	29.8	3.5
	East (90°)	49.1	43.8	35.3	31.3	23.9	18.2	0.0
	North (0°)	34.6	49.7	44.2	32.6	26.3	18.9	0.0
4	West (270°)	53.9	48.7	45.7	43.3	39.7	28.4	0.0
	South (180°)	53.5	48.4	45.3	42.8	39.7	28.0	0.0
	East (90°)	48.2	42.7	34.5	30.4	22.9	16.3	0.0
	North (0°)	33.7	48.9	43.1	31.9	25.4	17.1	0.0
5	West (270°)	50.7	44.9	42.9	40.4	35.3	20.5	0.0
	South (180°)	50.7	44.9	42.9	40.4	35.3	20.5	0.0
	East (90°)	44.6	38.4	31.2	26.9	18.7	8.3	0.0
	North (0°)	28.9	44.6	38.4	26.9	18.7	8.3	0.0
6	West (270°)	51.1	45.3	43.2	40.8	35.9	21.5	0.0
	South (180°)	51.1	45.3	43.2	40.8	35.9	21.5	0.0
	East (90°)	45.0	38.9	31.6	27.4	19.2	9.3	0.0
	North (0°)	29.3	45.0	38.9	27.4	19.2	9.3	0.0

	West (270°)	50.3	44.4	42.5	40.0	34.7	19.5	0.0	0.0
7	South (180°)	50.3	44.4	42.5	40.0	34.7	19.5	0.0	0.0
	East (90°)	44.2	37.9	30.8	26.5	18.1	7.3	0.0	0.0
	North (0°)	28.4	44.2	37.9	26.5	18.1	7.3	0.0	0.0
	West (270°)	54.5	48.8	44.6	41.8	35.1	22.4	0.0	0.0
8	South (180°)	56.2	50.7	47.3	44.8	40.1	29.0	2.2	0.0
	East (90°)	57.1	52.0	48.4	46.0	42.9	32.9	8.5	0.0
	North (0°)	45.7	55.8	50.7	44.1	40.9	31.3	7.5	0.0
	West (270°)	55.9	50.5	47.5	45.1	40.9	29.3	1.2	0.0
9	South (180°)	54.8	49.1	46.3	43.6	38.1	24.9	0.0	0.0
	East (90°)	52.6	47.0	42.9	39.5	34.0	19.3	0.0	0.0
	North (0°)	44.3	54.5	49.1	43.1	39.2	28.1	0.7	0.0
	West (270°)	56.4	51.0	47.9	45.5	41.5	30.3	2.7	0.0
10	South (180°)	55.3	49.8	46.8	44.2	39.1	26.9	0.0	0.0
	East (90°)	52.9	47.3	43.0	39.5	33.8	19.7	0.0	0.0
	North (0°)	44.3	54.7	49.3	43.1	39.2	28.3	1.3	0.0
	West (270°)	57.9	52.8	49.2	46.8	43.7	34.3	10.7	0.0
11	South (180°)	56.9	51.7	48.0	45.4	41.5	31.7	7.8	0.0
	East (90°)	54.4	49.0	44.1	41.0	34.4	23.3	0.0	0.0
	North (0°)	45.7	56.1	51.0	44.1	40.8	31.6	7.9	0.0
	West (270°)	53.3	47.8	45.2	42.8	38.4	26.5	0.0	0.0
12	South (180°)	50.4	44.5	40.5	37.7	30.4	17.2	0.0	0.0
	East (90°)	47.5	41.7	33.8	29.6	21.7	14.5	0.0	0.0
	North (0°)	42.1	51.3	46.3	40.5	37.9	25.0	0.0	0.0
	West (270°)	52.7	46.7	45.0	42.3	35.8	17.8	0.0	0.0
13	South (180°)	51.2	45.0	42.9	40.1	32.8	13.0	0.0	0.0
	East (90°)	47.9	41.4	37.0	33.6	25.5	7.2	0.0	0.0
	North (0°)	39.8	50.4	44.4	39.2	33.6	16.3	0.0	0.0
	West (270°)	50.8	46.6	45.2	42.5	35.7	17.0	0.0	0.0
14	South (180°)	50.7	45.1	43.2	40.2	33.1	12.7	0.0	0.0
	East (90°)	46.7	41.4	37.2	33.8	25.7	6.9	0.0	0.0
	North (0°)	39.8	46.8	44.1	39.6	33.1	15.4	0.0	0.0
	West (270°)	53.5	47.7	45.9	43.1	37.1	19.5	0.0	0.0
15	South (180°)	52.3	46.3	44.3	41.4	35.0	16.3	0.0	0.0
	East (90°)	49.1	42.5	37.7	34.5	26.7	9.4	0.0	0.0
	North (0°)	40.4	51.4	45.2	39.9	33.9	17.3	0.0	0.0
	West (270°)	53.8	47.9	46.1	43.3	37.5	20.0	0.0	0.0
16	South (180°)	52.7	46.7	44.7	41.8	35.4	17.0	0.0	0.0
	East (90°)	49.5	42.9	37.9	34.8	27.1	10.1	0.0	0.0
	North (0°)	40.6	51.6	45.4	40.1	34.2	17.9	0.0	0.0

27	West (270°)	55.0	49.3	45.7	43.0	37.1	23.7	0.0	0.0
	South (180°)	57.2	51.8	48.6	46.2	42.4	32.0	8.1	0.0
	East (90°)	57.0	51.8	48.4	45.9	42.4	32.3	8.2	0.0
	North (0°)	43.4	54.8	49.2	42.5	37.2	25.0	0.0	0.0
28	West (270°)	54.2	48.3	46.3	43.6	37.7	22.3	0.0	0.0
	South (180°)	54.0	48.1	46.0	43.3	37.8	22.8	0.0	0.0
	East (90°)	50.8	44.6	40.9	37.9	32.0	16.7	0.0	0.0
	North (0°)	39.0	51.1	44.9	38.4	31.6	13.5	0.0	0.0
29	West (270°)	55.1	49.4	47.1	44.4	39.1	25.6	0.0	0.0
	South (180°)	55.0	49.3	46.9	44.3	39.4	25.9	0.0	0.0
	East (90°)	51.8	45.7	41.8	38.8	32.9	18.5	0.0	0.0
	North (0°)	39.5	51.9	45.7	39.0	31.7	15.9	0.0	0.0
30	West (270°)	50.5	44.4	42.7	39.8	32.0	9.8	0.0	0.0
	South (180°)	49.6	43.5	41.5	38.6	31.1	9.7	0.0	0.0
	East (90°)	46.5	40.2	36.7	33.1	27.1	6.4	0.0	0.0
	North (0°)	36.8	48.2	42.0	36.5	29.0	7.3	0.0	0.0
31	West (270°)	52.9	46.9	45.2	42.6	35.9	17.2	0.0	0.0
	South (180°)	51.7	45.7	43.8	40.9	34.2	14.7	0.0	0.0
	East (90°)	48.3	41.8	37.6	34.4	26.7	8.2	0.0	0.0
	North (0°)	39.4	50.5	44.3	39.0	32.4	14.4	0.0	0.0
32	West (270°)	45.5	39.4	37.9	34.9	26.4	2.9	0.0	0.0
	South (180°)	44.5	38.4	36.6	33.6	25.4	2.6	0.0	0.0
	East (90°)	39.4	32.5	25.9	21.0	10.3	0.0	0.0	0.0
	North (0°)	29.7	42.0	35.6	29.4	20.0	0.0	0.0	0.0
33	West (270°)	48.7	42.6	41.1	38.1	29.9	7.7	0.0	0.0
	South (180°)	47.6	41.5	39.6	36.6	28.7	7.2	0.0	0.0
	East (90°)	42.6	35.7	29.1	24.2	13.7	0.0	0.0	0.0
	North (0°)	33.3	45.3	39.1	32.9	24.3	0.0	0.0	0.0
34	West (270°)	55.5	49.8	47.1	44.6	39.7	27.2	0.0	0.0
	South (180°)	55.6	50.2	47.5	44.9	41.0	28.1	0.0	0.0
	East (90°)	53.4	47.8	44.1	41.3	36.9	25.0	0.0	0.0
	North (0°)	39.9	52.6	46.7	39.1	32.4	18.9	0.0	0.0
35	West (270°)	55.3	49.6	47.2	44.6	39.4	26.3	0.0	0.0
	South (180°)	55.4	49.7	47.3	44.7	39.8	26.8	0.0	0.0
	East (90°)	52.2	46.3	42.5	39.5	33.7	19.7	0.0	0.0
	North (0°)	39.4	52.0	45.9	38.8	31.4	16.2	0.0	0.0
36	West (270°)	56.9	51.6	48.5	45.9	41.9	31.1	5.7	0.0
	South (180°)	56.8	51.1	48.1	45.5	41.2	29.5	1.0	0.0
	East (90°)	54.6	49.0	44.9	42.1	37.3	25.8	0.0	0.0
	North (0°)	42.3	54.4	48.6	41.0	36.4	26.0	0.0	0.0

		West (270°)	56.1	50.6	47.7	45.1	40.4	28.3	0.0	0.0
37	South (180°)	56.6	51.3	48.5	45.9	42.1	29.9	1.1	0.0	
	East (90°)	54.4	49.0	45.1	42.3	38.3	27.3	0.0	0.0	
	North (0°)	39.9	53.1	47.3	39.0	32.2	20.0	0.0	0.0	
	West (270°)	55.7	50.2	47.3	44.8	40.0	27.8	0.0	0.0	
38	South (180°)	56.1	50.8	48.0	45.4	41.6	29.1	0.0	0.0	
	East (90°)	54.0	48.5	44.7	41.9	37.7	26.3	0.0	0.0	
	North (0°)	39.9	52.9	47.0	39.0	32.3	19.5	0.0	0.0	
	West (270°)	55.3	49.4	45.8	43.1	37.8	24.6	0.0	0.0	
39	South (180°)	55.3	49.5	46.1	43.2	37.4	23.8	0.0	0.0	
	East (90°)	56.9	51.4	48.2	45.7	41.5	30.7	5.9	0.0	
	North (0°)	47.1	57.0	51.6	46.0	42.0	31.0	6.0	0.0	
	West (270°)	54.9	49.0	45.7	43.2	38.1	24.6	0.0	0.0	
40	South (180°)	55.0	49.2	46.1	43.4	38.3	24.9	0.0	0.0	
	East (90°)	55.8	50.3	47.6	44.9	40.3	26.9	0.0	0.0	
	North (0°)	45.8	55.9	50.3	45.0	40.1	27.1	0.0	0.0	
	West (270°)	56.2	50.9	47.7	45.0	41.7	29.9	4.6	0.0	
41	South (180°)	55.7	49.9	46.6	43.8	37.8	24.0	0.0	0.0	
	East (90°)	56.3	50.6	47.3	44.7	39.2	25.3	0.0	0.0	
	North (0°)	47.2	57.1	51.7	46.0	42.2	31.4	6.9	0.0	
	West (270°)	57.6	52.4	49.1	46.6	42.9	32.2	5.9	0.0	
42	South (180°)	57.1	51.7	48.2	45.7	41.7	30.9	4.9	0.0	
	East (90°)	55.4	49.9	45.8	43.1	38.2	26.5	0.0	0.0	
	North (0°)	45.6	55.9	50.7	44.2	40.6	29.0	0.6	0.0	
	West (270°)	57.2	51.8	48.6	46.1	42.0	30.9	3.8	0.0	
43	South (180°)	57.1	51.6	48.3	45.8	41.5	30.3	3.3	0.0	
	East (90°)	55.9	50.4	46.8	44.2	39.8	27.7	0.0	0.0	
	North (0°)	45.6	55.9	50.6	44.3	40.6	28.1	0.0	0.0	
	West (270°)	56.6	51.4	48.1	45.5	42.2	30.4	5.4	0.0	
44	South (180°)	57.1	51.8	48.4	45.9	42.2	31.7	7.7	0.0	
	East (90°)	55.2	49.9	45.4	42.7	39.4	27.5	0.3	0.0	
	North (0°)	44.5	55.4	50.0	43.2	39.2	28.3	1.0	0.0	
	West (270°)	56.1	50.8	47.8	45.4	41.3	30.4	4.6	0.0	
45	South (180°)	55.0	49.3	46.5	43.9	38.5	24.9	0.0	0.0	
	East (90°)	52.7	47.0	42.3	39.5	34.0	21.6	0.0	0.0	
	North (0°)	44.3	54.4	49.2	42.7	39.5	29.6	4.5	0.0	
	West (270°)	54.1	48.3	45.2	42.6	36.4	22.3	0.0	0.0	
46	South (180°)	55.2	49.8	46.9	44.4	40.2	29.3	3.4	0.0	
	East (90°)	52.9	47.9	44.2	41.4	39.2	27.5	1.1	0.0	
	North (0°)	39.8	51.9	46.2	38.9	32.9	20.1	0.0	0.0	

		West (270°)	55.9	50.4	47.6	45.1	40.6	28.2	0.0	0.0
47	South (180°)	56.3	50.8	47.9	45.5	41.4	29.8	1.0	0.0	
	East (90°)	53.9	48.4	44.3	41.8	37.8	26.6	0.0	0.0	
	North (0°)	41.3	53.2	47.5	40.3	35.0	22.2	0.0	0.0	
	West (270°)	55.9	50.5	47.7	45.2	40.9	28.7	0.0	0.0	
48	South (180°)	55.4	49.8	47.1	44.6	39.8	26.8	0.0	0.0	
	East (90°)	52.9	47.1	42.9	40.2	35.2	22.5	0.0	0.0	
	North (0°)	42.9	53.7	48.2	41.7	37.7	26.4	0.0	0.0	
	West (270°)	54.7	48.9	46.4	43.8	38.3	24.3	0.0	0.0	
49	South (180°)	55.1	49.5	46.8	44.3	39.5	26.9	0.0	0.0	
	East (90°)	53.2	47.7	44.0	41.3	37.4	26.0	0.0	0.0	
	North (0°)	41.2	52.6	46.8	40.2	35.3	22.5	0.0	0.0	
	West (270°)	54.1	48.3	45.8	43.2	37.6	23.4	0.0	0.0	
50	South (180°)	54.4	48.8	46.2	43.6	38.7	25.7	0.0	0.0	
	East (90°)	52.7	47.2	43.6	41.0	36.9	25.1	0.0	0.0	
	North (0°)	41.0	52.2	46.4	40.1	35.1	22.2	0.0	0.0	
	West (270°)	57.5	52.1	48.3	45.7	41.0	29.6	1.9	0.0	
51	South (180°)	57.7	52.5	48.6	46.0	42.5	32.4	8.3	0.0	
	East (90°)	58.3	53.2	49.2	46.8	43.9	34.7	11.3	0.0	
	North (0°)	47.8	58.0	52.8	46.3	42.9	33.2	9.1	0.0	
	West (270°)	57.9	52.7	49.0	46.5	42.6	32.4	8.2	0.0	
52	South (180°)	57.5	52.0	48.2	45.7	41.2	29.8	1.8	0.0	
	East (90°)	57.5	52.3	48.3	45.8	42.3	32.1	6.4	0.0	
	North (0°)	47.9	57.7	52.7	46.2	43.5	33.3	9.2	0.0	
	West (270°)	56.3	50.9	47.9	45.3	40.9	29.0	1.0	0.0	
53	South (180°)	56.2	51.1	48.1	45.5	42.7	30.3	2.6	0.0	
	East (90°)	54.9	49.6	45.3	42.9	39.4	29.2	2.9	0.0	
	North (0°)	41.8	54.2	48.5	40.9	35.1	23.0	0.0	0.0	
	West (270°)	56.1	50.6	47.7	45.1	40.7	28.6	0.2	0.0	
54	South (180°)	56.7	51.3	48.3	45.9	42.1	30.8	3.2	0.0	
	East (90°)	54.4	49.0	44.8	42.4	38.7	28.0	0.5	0.0	
	North (0°)	41.0	53.3	47.5	40.1	34.2	21.5	0.0	0.0	
	West (270°)	44.3	38.5	36.9	33.8	26.1	3.3	0.0	0.0	
55	South (180°)	44.6	38.5	37.0	34.1	26.1	3.4	0.0	0.0	
	East (90°)	38.9	31.9	25.4	21.7	12.1	0.0	0.0	0.0	
	North (0°)	22.1	38.4	31.6	20.2	9.9	0.0	0.0	0.0	
	West (270°)	44.2	38.4	36.8	33.7	26.0	2.4	0.0	0.0	
56	South (180°)	44.5	38.5	36.9	34.0	25.9	2.7	0.0	0.0	
	East (90°)	39.0	32.0	25.5	21.8	12.4	0.0	0.0	0.0	
	North (0°)	22.1	38.4	31.6	20.2	9.8	0.0	0.0	0.0	

	West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	West (270°)	43.0	37.6	35.8	32.0	24.5	0.0	0.0
58	South (180°)	43.7	37.6	36.1	33.1	24.5	0.0	0.0
	East (90°)	38.9	31.6	25.2	22.4	13.5	0.0	0.0
	North (0°)	21.1	37.6	30.7	19.2	8.4	0.0	0.0
	West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	West (270°)	47.9	41.7	39.4	36.4	28.8	9.5	0.0
61	South (180°)	50.2	44.2	42.5	39.9	33.7	16.7	0.0
	East (90°)	48.9	42.9	40.7	38.1	32.3	16.1	0.0
	North (0°)	31.2	45.2	39.0	30.2	21.5	4.7	0.0
	West (270°)	51.6	45.8	43.8	41.1	35.3	20.1	0.0
62	South (180°)	51.9	45.9	43.9	41.3	35.2	20.0	0.0
	East (90°)	48.0	41.7	38.0	34.8	26.5	8.9	0.0
	North (0°)	34.6	47.4	41.3	33.5	27.4	10.0	0.0
	West (270°)	47.9	41.6	37.2	34.5	26.8	12.7	0.0
63	South (180°)	51.1	45.4	43.2	40.7	35.7	22.2	0.0
	East (90°)	49.2	44.0	41.4	38.5	35.5	20.7	0.0
	North (0°)	29.3	45.1	39.0	27.3	19.1	10.0	0.0
	West (270°)	55.4	50.3	46.9	44.5	41.0	31.4	8.0
64	South (180°)	55.5	50.4	47.1	44.6	41.1	31.4	8.0
	East (90°)	51.5	46.0	40.7	37.5	29.8	20.0	0.0
	North (0°)	36.9	51.1	45.5	35.6	28.1	19.9	0.0
	West (270°)	53.7	48.6	45.4	43.0	39.7	29.0	2.5
65	South (180°)	53.7	48.6	45.4	43.0	39.7	29.0	2.5
	East (90°)	48.1	42.8	34.4	30.4	23.0	17.1	0.0
	North (0°)	32.7	48.1	42.8	30.4	23.0	17.1	0.0
	West (270°)	45.3	39.3	37.8	35.0	27.4	5.7	0.0
66	South (180°)	45.3	39.3	37.8	35.0	27.4	5.7	0.0
	East (90°)	39.2	32.4	25.8	21.2	11.2	0.0	0.0
	North (0°)	23.0	39.2	32.4	21.2	11.2	0.0	0.0

67	West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	West (270°)	41.8	35.4	32.9	29.9	20.8	0.0	0.0
	South (180°)	43.9	37.8	36.3	33.3	24.8	0.3	0.0
	East (90°)	41.6	36.0	33.8	30.1	23.1	0.0	0.0
	North (0°)	21.4	37.8	30.9	19.5	8.7	0.0	0.0
69	West (270°)	34.9	27.6	21.2	18.2	8.6	0.0	0.0
	South (180°)	39.8	33.7	32.1	28.9	19.5	0.0	0.0
	East (90°)	39.1	33.8	32.0	28.1	19.6	0.0	0.0
	North (0°)	17.1	33.8	26.8	15.0	3.5	0.0	0.0
70	West (270°)	56.2	50.9	46.4	43.8	38.8	27.6	2.1
	South (180°)	57.5	52.5	47.9	45.6	43.1	34.8	13.7
	East (90°)	58.2	53.3	49.3	46.8	44.2	35.6	14.1
	North (0°)	46.7	57.2	52.0	45.5	41.4	30.7	5.5
71	West (270°)	56.7	51.4	48.2	45.7	42.0	31.6	6.4
	South (180°)	55.2	49.9	45.8	43.3	40.1	30.5	6.1
	East (90°)	54.2	48.5	44.7	41.9	35.5	22.1	0.0
	North (0°)	45.6	56.0	50.4	44.9	39.7	26.8	0.0
72	West (270°)	56.0	50.6	47.6	45.0	40.9	29.5	2.0
	South (180°)	53.6	48.3	44.5	41.5	38.8	26.7	0.0
	East (90°)	54.0	48.2	44.8	42.1	35.9	21.6	0.0
	North (0°)	45.5	55.9	50.2	44.8	39.5	25.9	0.0
73	West (270°)	55.4	49.8	47.0	44.4	39.9	27.6	0.0
	South (180°)	53.1	47.7	44.0	41.0	37.8	24.9	0.0
	East (90°)	53.8	47.9	44.8	42.0	36.1	21.2	0.0
	North (0°)	45.1	55.5	49.7	44.6	39.0	24.6	0.0
74	West (270°)	55.2	49.5	45.9	43.2	37.7	25.1	0.0
	South (180°)	53.0	47.4	42.3	38.9	32.2	21.1	0.0
	East (90°)	55.0	50.0	46.4	43.8	41.4	30.3	6.2
	North (0°)	47.3	56.9	51.7	46.1	42.4	32.2	8.6
75	West (270°)	54.7	49.1	46.4	43.8	39.0	26.9	0.0
	South (180°)	51.9	45.8	41.3	38.2	31.0	17.5	0.0
	East (90°)	52.9	46.9	43.9	41.0	34.0	17.8	0.0
	North (0°)	45.2	55.0	49.4	44.4	39.8	25.7	0.0
76	West (270°)	55.0	49.3	46.6	44.0	39.1	25.9	0.0
	South (180°)	52.8	47.2	43.5	40.4	36.6	22.8	0.0
	East (90°)	54.1	48.2	45.3	42.6	37.2	22.7	0.0
	North (0°)	45.5	55.7	49.8	44.9	39.5	25.1	0.0

77	West (270°)	54.5	48.8	45.7	43.1	38.2	26.0	0.0	0.0
	South (180°)	52.1	46.3	41.8	38.7	31.9	18.8	0.0	0.0
	East (90°)	54.1	48.8	45.3	42.6	38.9	27.8	0.4	0.0
	North (0°)	46.2	55.8	50.5	45.1	41.1	29.7	1.6	0.0
78	West (270°)	54.9	49.3	45.6	42.9	37.5	25.2	0.0	0.0
	South (180°)	52.8	47.3	42.3	39.2	32.2	21.1	0.0	0.0
	East (90°)	54.4	49.5	45.7	42.9	40.9	30.1	6.2	0.0
	North (0°)	46.9	56.5	51.3	45.5	42.0	32.1	8.6	0.0
79	West (270°)	52.5	46.8	44.1	41.1	35.3	18.6	0.0	0.0
	South (180°)	53.9	48.4	45.8	43.3	38.4	25.5	0.0	0.0
	East (90°)	53.4	47.6	44.5	42.0	37.5	25.2	0.0	0.0
	North (0°)	40.5	51.9	46.0	40.0	33.6	17.2	0.0	0.0
80	West (270°)	53.5	48.1	44.1	41.4	35.1	22.7	0.0	0.0
	South (180°)	55.5	50.5	47.1	44.7	41.3	31.5	7.9	0.0
	East (90°)	53.8	49.3	45.8	43.0	40.9	29.8	5.6	0.0
	North (0°)	40.0	52.0	46.8	39.4	32.1	20.4	0.0	0.0
81	West (270°)	52.9	47.0	44.4	41.7	35.9	21.5	0.0	0.0
	South (180°)	53.8	48.1	45.8	43.2	38.2	24.5	0.0	0.0
	East (90°)	51.6	45.9	42.9	40.0	35.7	20.8	0.0	0.0
	North (0°)	38.0	50.5	44.4	37.6	29.4	13.0	0.0	0.0
82	West (270°)	52.6	46.6	44.4	41.6	35.1	18.9	0.0	0.0
	South (180°)	50.7	44.5	41.6	38.4	31.2	11.4	0.0	0.0
	East (90°)	51.5	45.4	42.9	39.8	32.4	12.7	0.0	0.0
	North (0°)	42.6	53.1	47.1	42.3	35.7	19.0	0.0	0.0
83	West (270°)	52.2	46.2	44.1	41.2	34.5	17.2	0.0	0.0
	South (180°)	50.6	44.5	41.8	38.7	31.6	11.5	0.0	0.0
	East (90°)	51.1	45.0	42.6	39.5	32.1	12.5	0.0	0.0
	North (0°)	41.9	52.5	46.5	41.6	34.8	17.3	0.0	0.0
84	West (270°)	52.9	46.9	44.7	41.9	35.5	19.8	0.0	0.0
	South (180°)	50.9	44.5	41.4	38.4	31.0	12.9	0.0	0.0
	East (90°)	51.7	45.6	43.1	40.1	33.2	14.3	0.0	0.0
	North (0°)	43.0	53.4	47.4	42.6	36.3	20.1	0.0	0.0
85	West (270°)	51.7	45.5	43.5	40.6	33.0	13.5	0.0	0.0
	South (180°)	50.6	44.1	41.4	38.4	31.2	11.6	0.0	0.0
	East (90°)	51.2	45.1	42.8	39.9	32.8	14.1	0.0	0.0
	North (0°)	41.1	52.1	45.8	40.8	33.5	14.3	0.0	0.0
86	West (270°)	53.0	47.4	45.1	42.3	37.5	22.4	0.0	0.0
	South (180°)	53.6	47.8	45.6	43.0	37.8	23.5	0.0	0.0
	East (90°)	50.8	44.5	40.9	38.1	31.1	15.2	0.0	0.0
	North (0°)	37.9	50.3	44.2	37.5	29.2	12.2	0.0	0.0

87	West (270°)	52.9	47.3	45.0	42.2	37.4	22.2	0.0	0.0
	South (180°)	53.6	47.8	45.5	43.0	37.7	23.5	0.0	0.0
	East (90°)	50.9	44.7	41.2	38.4	31.6	15.7	0.0	0.0
	North (0°)	37.8	50.3	44.1	37.4	29.0	12.1	0.0	0.0
88	West (270°)	52.8	47.1	44.9	42.0	37.1	21.8	0.0	0.0
	South (180°)	53.5	47.7	45.5	42.9	37.6	23.2	0.0	0.0
	East (90°)	51.0	44.7	41.3	38.6	31.9	16.0	0.0	0.0
	North (0°)	37.8	50.2	44.0	37.4	29.0	11.9	0.0	0.0
89	West (270°)	52.5	46.8	44.5	41.7	36.9	21.5	0.0	0.0
	South (180°)	53.3	47.5	45.3	42.8	37.5	23.1	0.0	0.0
	East (90°)	51.0	44.8	41.5	38.8	32.3	16.4	0.0	0.0
	North (0°)	37.7	50.1	43.9	37.3	28.9	11.8	0.0	0.0
90	West (270°)	51.8	46.2	41.5	38.3	30.9	19.9	0.0	0.0
	South (180°)	55.2	50.1	46.7	44.3	40.8	31.1	7.2	0.0
	East (90°)	55.2	50.1	46.6	44.3	41.0	31.2	7.2	0.0
	North (0°)	39.1	51.7	46.1	38.1	32.1	20.9	0.0	0.0
91	West (270°)	51.6	45.6	43.3	40.5	34.0	17.4	0.0	0.0
	South (180°)	52.7	46.7	44.7	42.1	36.5	21.2	0.0	0.0
	East (90°)	51.2	45.2	42.6	40.0	34.5	19.6	0.0	0.0
	North (0°)	37.5	49.6	43.4	37.1	29.5	11.7	0.0	0.0
92	West (270°)	51.5	45.8	43.8	41.0	33.9	15.9	0.0	0.0
	South (180°)	51.7	46.0	44.0	41.4	35.1	18.2	0.0	0.0
	East (90°)	50.4	44.4	41.8	39.1	32.8	15.9	0.0	0.0
	North (0°)	38.6	50.1	44.0	38.4	30.5	10.6	0.0	0.0
93	West (270°)	49.7	45.2	43.2	40.3	32.4	11.7	0.0	0.0
	South (180°)	50.1	45.0	42.9	40.1	32.9	14.0	0.0	0.0
	East (90°)	50.5	44.8	42.5	39.6	33.0	14.9	0.0	0.0
	North (0°)	40.0	50.0	44.9	39.6	32.6	12.4	0.0	0.0
94	West (270°)	52.7	46.8	44.6	41.9	36.2	21.4	0.0	0.0
	South (180°)	53.1	47.2	45.1	42.5	37.1	22.1	0.0	0.0
	East (90°)	50.6	44.5	41.6	38.8	32.3	16.0	0.0	0.0
	North (0°)	37.7	50.0	43.8	37.3	29.1	11.2	0.0	0.0
95	West (270°)	53.5	47.9	44.8	42.3	38.2	25.5	0.0	0.0
	South (180°)	53.8	48.3	45.7	43.2	38.1	24.3	0.0	0.0
	East (90°)	52.0	46.7	43.7	40.7	34.1	19.3	0.0	0.0
	North (0°)	41.7	51.9	46.9	40.8	35.9	23.4	0.0	0.0
96	West (270°)	53.2	48.7	44.8	42.0	40.3	29.5	5.2	0.0
	South (180°)	55.4	50.4	46.9	44.5	41.2	31.4	7.6	0.0
	East (90°)	54.2	48.7	44.9	42.5	37.4	25.2	0.0	0.0
	North (0°)	40.6	52.4	47.1	39.6	34.3	22.9	0.0	0.0

97	West (270°)	54.6	49.2	46.2	43.7	39.6	28.5	2.0	0.0
	South (180°)	52.0	46.1	42.3	39.4	32.6	18.7	0.0	0.0
	East (90°)	52.2	46.3	42.8	39.9	33.0	18.7	0.0	0.0
	North (0°)	44.9	54.7	49.3	43.8	39.7	28.5	2.0	0.0
98	West (270°)	56.2	51.0	47.7	45.3	41.9	31.9	8.0	0.0
	South (180°)	55.3	50.2	46.4	43.9	40.8	31.4	7.9	0.0
	East (90°)	52.6	47.0	42.1	39.0	31.5	20.6	0.0	0.0
	North (0°)	42.8	54.0	48.4	41.8	36.7	24.7	0.0	0.0
99	West (270°)	55.1	49.9	46.7	44.3	40.8	30.3	5.2	0.0
	South (180°)	52.7	46.9	43.4	40.6	34.0	20.2	0.0	0.0
	East (90°)	51.2	45.5	40.0	36.9	29.6	18.9	0.0	0.0
	North (0°)	44.7	54.4	49.2	43.2	40.2	30.2	5.2	0.0
100	West (270°)	55.8	50.9	47.2	44.9	42.0	32.4	7.9	0.0
	South (180°)	53.8	49.1	45.3	42.6	40.4	29.6	5.2	0.0
	East (90°)	51.4	46.0	39.3	35.9	28.1	20.7	0.0	0.0
	North (0°)	42.7	53.7	48.5	41.2	37.8	27.6	0.4	0.0
101	West (270°)	52.8	46.9	44.5	41.8	36.2	21.3	0.0	0.0
	South (180°)	52.1	46.2	43.5	40.8	35.5	21.0	0.0	0.0
	East (90°)	52.1	46.2	43.4	40.7	34.9	20.6	0.0	0.0
	North (0°)	42.2	52.8	46.8	41.7	35.7	20.9	0.0	0.0
102	West (270°)	52.6	47.0	42.7	39.7	32.5	20.6	0.0	0.0
	South (180°)	55.2	50.1	46.5	44.0	40.8	31.4	7.9	0.0
	East (90°)	55.4	50.3	46.9	44.4	41.0	31.4	7.9	0.0
	North (0°)	41.2	53.0	47.4	40.6	33.5	20.8	0.0	0.0
103	West (270°)	52.2	46.7	43.5	40.6	36.7	23.0	0.0	0.0
	South (180°)	53.5	47.8	44.9	42.4	37.7	25.0	0.0	0.0
	East (90°)	53.6	47.7	45.0	42.5	37.3	23.2	0.0	0.0
	North (0°)	42.0	52.7	47.0	41.3	36.0	21.8	0.0	0.0
104	West (270°)	52.6	46.7	43.2	40.5	35.3	22.3	0.0	0.0
	South (180°)	54.0	48.3	45.5	42.9	37.9	24.6	0.0	0.0
	East (90°)	54.3	48.7	46.0	43.4	38.9	25.8	0.0	0.0
	North (0°)	42.5	53.1	47.4	41.6	36.9	24.3	0.0	0.0
105	West (270°)	55.7	50.5	47.0	44.5	41.4	31.4	7.6	0.0
	South (180°)	56.0	50.8	47.5	45.1	41.4	31.4	7.6	0.0
	East (90°)	53.0	47.2	42.6	39.7	33.1	20.9	0.0	0.0
	North (0°)	40.3	52.6	47.0	39.5	33.4	21.5	0.0	0.0
106	West (270°)	47.9	41.8	39.9	36.7	28.1	4.3	0.0	0.0
	South (180°)	49.0	42.8	41.1	38.2	30.4	8.9	0.0	0.0
	East (90°)	46.8	40.5	38.2	35.2	27.8	7.6	0.0	0.0
	North (0°)	30.7	44.7	38.2	29.7	20.6	0.0	0.0	0.0

107	West (270°)	48.0	42.0	39.7	36.7	29.3	9.2	0.0	0.0
	South (180°)	50.4	44.4	42.7	40.1	33.6	16.1	0.0	0.0
	East (90°)	48.6	42.5	40.2	37.6	31.7	15.5	0.0	0.0
	North (0°)	28.2	44.2	37.6	26.4	17.2	4.0	0.0	0.0
108	West (270°)	53.8	48.0	45.3	42.7	38.1	25.2	0.0	0.0
	South (180°)	54.5	48.9	46.6	44.1	39.4	25.7	0.0	0.0
	East (90°)	51.5	45.4	41.9	39.1	33.5	19.0	0.0	0.0
	North (0°)	34.8	49.6	43.4	33.6	25.6	14.3	0.0	0.0
109	West (270°)	52.2	46.6	43.4	40.6	34.3	19.9	0.0	0.0
	South (180°)	54.9	49.6	46.9	44.4	40.2	29.0	2.8	0.0
	East (90°)	53.6	48.4	44.8	42.4	39.1	28.8	2.8	0.0
	North (0°)	33.6	49.2	43.6	31.5	23.6	17.1	0.0	0.0
110	West (270°)	56.6	51.5	47.9	45.5	42.3	32.4	7.9	0.0
	South (180°)	55.5	50.0	46.4	43.8	39.1	27.4	0.0	0.0
	East (90°)	54.6	49.1	45.2	42.4	36.8	24.0	0.0	0.0
	North (0°)	45.9	55.8	50.7	44.3	41.3	31.5	7.5	0.0
111	West (270°)	52.4	46.5	43.7	40.7	35.7	19.5	0.0	0.0
	South (180°)	54.1	48.3	46.0	43.4	37.9	23.2	0.0	0.0
	East (90°)	53.8	47.9	45.5	42.9	37.2	21.7	0.0	0.0
	North (0°)	41.0	52.3	46.1	40.6	34.1	17.4	0.0	0.0
112	West (270°)	52.8	46.9	43.7	40.7	35.2	19.5	0.0	0.0
	South (180°)	54.0	47.9	45.1	42.3	36.5	22.1	0.0	0.0
	East (90°)	55.0	49.2	46.6	44.1	39.1	25.7	0.0	0.0
	North (0°)	43.1	53.9	47.9	42.3	37.3	23.6	0.0	0.0
113	West (270°)	55.7	50.7	46.5	43.7	41.1	30.2	6.0	0.0
	South (180°)	56.9	51.8	48.0	45.4	41.6	31.8	8.1	0.0
	East (90°)	57.1	52.0	48.0	45.6	41.9	32.3	8.9	0.0
	North (0°)	46.2	56.4	51.4	44.7	41.2	32.0	8.8	0.0
114	West (270°)	53.9	48.1	44.4	41.6	35.5	22.0	0.0	0.0
	South (180°)	56.2	50.8	47.8	45.2	41.2	30.3	5.0	0.0
	East (90°)	56.2	50.8	47.7	45.2	41.2	30.4	5.0	0.0
	North (0°)	42.3	53.9	48.1	41.7	35.6	22.3	0.0	0.0
115	West (270°)	54.9	49.3	45.4	42.7	37.3	24.7	0.0	0.0
	South (180°)	55.7	50.2	46.7	44.2	39.1	26.8	0.0	0.0
	East (90°)	56.7	51.5	47.8	45.4	42.2	32.4	8.6	0.0
	North (0°)	46.0	55.9	50.9	44.3	41.5	31.9	8.5	0.0
116	West (270°)	54.4	48.7	45.7	43.1	37.6	23.6	0.0	0.0
	South (180°)	54.5	48.9	46.0	43.2	37.9	23.6	0.0	0.0
	East (90°)	54.6	49.2	45.6	43.1	39.6	29.0	2.8	0.0
	North (0°)	44.1	54.2	49.0	42.6	39.4	28.9	2.8	0.0

117	West (270°)	55.7	50.4	47.3	44.8	41.1	29.2	0.6	0.0
	South (180°)	55.6	50.1	47.0	44.5	40.2	28.5	0.4	0.0
	East (90°)	53.5	47.7	43.7	41.0	35.5	22.5	0.0	0.0
	North (0°)	42.8	53.5	48.0	41.4	37.7	24.5	0.0	0.0
118	West (270°)	56.2	51.0	47.7	45.2	41.9	31.0	4.6	0.0
	South (180°)	56.0	50.7	47.3	44.9	41.0	30.3	4.3	0.0
	East (90°)	53.5	47.8	43.3	40.6	34.9	22.3	0.0	0.0
	North (0°)	42.9	53.7	48.4	41.5	37.9	25.2	0.0	0.0
119	West (270°)	56.7	51.5	47.8	45.4	42.4	32.6	8.3	0.0
	South (180°)	56.6	51.4	47.8	45.4	41.9	32.0	8.0	0.0
	East (90°)	54.0	48.3	43.7	40.8	35.4	23.7	0.0	0.0
	North (0°)	43.1	53.9	48.8	41.2	38.4	26.1	0.0	0.0
120	West (270°)	55.4	50.1	47.3	44.8	40.2	28.1	0.0	0.0
	South (180°)	54.7	49.5	46.3	43.8	39.0	27.2	0.0	0.0
	East (90°)	52.0	48.0	44.6	41.9	36.4	22.4	0.0	0.0
	North (0°)	43.8	52.8	48.6	42.8	38.5	24.0	0.0	0.0
121	West (270°)	55.8	50.4	47.5	45.0	40.7	28.7	0.0	0.0
	South (180°)	55.3	49.6	46.4	43.8	39.2	27.5	0.0	0.0
	East (90°)	53.8	48.0	44.4	41.7	36.4	22.9	0.0	0.0
	North (0°)	43.4	54.3	48.4	42.3	37.9	24.5	0.0	0.0
122	West (270°)	55.0	49.3	46.6	44.0	39.3	26.1	0.0	0.0
	South (180°)	54.6	49.1	46.3	43.6	39.2	25.1	0.0	0.0
	East (90°)	53.8	48.1	44.7	42.1	37.5	25.2	0.0	0.0
	North (0°)	42.9	53.7	48.1	41.7	37.8	25.4	0.0	0.0
123	West (270°)	56.7	51.3	47.6	45.1	41.5	31.6	7.8	0.0
	South (180°)	57.1	51.7	48.4	45.9	42.0	31.8	7.8	0.0
	East (90°)	56.1	50.5	47.4	44.6	39.9	26.0	0.0	0.0
	North (0°)	44.7	55.6	50.0	43.8	38.9	25.4	0.0	0.0
124	West (270°)	57.0	51.8	48.5	46.1	42.5	32.4	8.4	0.0
	South (180°)	55.4	49.9	46.4	43.8	38.6	26.2	0.0	0.0
	East (90°)	54.2	48.6	44.4	41.6	35.4	22.7	0.0	0.0
	North (0°)	46.3	56.2	51.0	44.9	41.5	31.8	8.3	0.0
125	West (270°)	56.0	50.6	47.6	45.1	41.0	30.0	4.2	0.0
	South (180°)	55.0	49.7	46.7	44.0	40.5	28.3	1.9	0.0
	East (90°)	53.7	47.9	44.3	41.7	35.8	21.8	0.0	0.0
	North (0°)	43.5	54.6	48.8	42.7	37.4	23.9	0.0	0.0
126	West (270°)	56.0	50.5	47.6	45.2	40.7	28.7	0.0	0.0
	South (180°)	55.4	49.9	46.9	44.3	39.7	27.2	0.0	0.0
	East (90°)	54.0	48.3	44.8	42.0	36.8	23.6	0.0	0.0
	North (0°)	44.3	54.8	49.2	43.4	38.6	26.5	0.0	0.0

127	West (270°)	53.6	47.7	44.9	42.3	37.0	23.9	0.0	0.0
	South (180°)	54.3	48.7	46.2	43.6	39.1	26.1	0.0	0.0
	East (90°)	52.0	46.3	43.1	40.1	36.0	21.8	0.0	0.0
	North (0°)	38.6	51.1	45.1	38.1	29.9	14.5	0.0	0.0
128	West (270°)	53.6	48.2	44.9	42.4	38.2	26.8	0.0	0.0
	South (180°)	52.8	47.4	43.9	41.0	38.0	25.3	0.0	0.0
	East (90°)	53.1	47.6	44.3	41.7	36.9	24.7	0.0	0.0
	North (0°)	42.5	53.3	47.6	41.4	37.2	25.0	0.0	0.0
129	West (270°)	55.1	50.0	46.4	44.0	40.9	31.4	8.0	0.0
	South (180°)	53.2	47.6	43.1	40.3	36.6	26.8	2.0	0.0
	East (90°)	52.8	47.3	43.1	40.3	34.6	22.6	0.0	0.0
	North (0°)	43.4	54.0	48.5	42.1	38.3	27.5	2.0	0.0
130	West (270°)	53.0	47.4	44.8	42.3	37.8	25.4	0.0	0.0
	South (180°)	49.4	43.5	38.9	35.5	30.5	15.6	0.0	0.0
	East (90°)	50.5	44.6	41.2	38.4	31.8	16.6	0.0	0.0
	North (0°)	43.6	53.4	47.8	42.7	38.1	25.5	0.0	0.0
131	West (270°)	53.1	47.6	43.2	40.2	32.9	21.2	0.0	0.0
	South (180°)	52.3	46.7	40.5	37.4	30.4	21.3	0.0	0.0
	East (90°)	56.0	50.9	47.3	44.9	41.9	32.3	8.7	0.0
	North (0°)	46.8	56.2	51.2	45.3	42.2	32.2	8.7	0.0
132	West (270°)	50.4	44.1	41.3	38.4	31.2	13.5	0.0	0.0
	South (180°)	48.9	42.8	39.2	35.9	29.8	12.2	0.0	0.0
	East (90°)	51.5	45.8	43.4	40.6	36.0	20.9	0.0	0.0
	North (0°)	42.4	52.5	46.6	41.9	36.3	21.4	0.0	0.0
133	West (270°)	54.7	49.8	46.2	43.8	40.8	31.2	7.5	0.0
	South (180°)	49.8	44.9	37.4	33.4	25.6	19.7	0.0	0.0
	East (90°)	50.9	45.7	40.2	36.9	31.4	20.3	0.0	0.0
	North (0°)	45.8	55.2	50.2	44.5	41.1	31.3	7.5	0.0
134	West (270°)	54.3	49.2	45.9	43.4	40.1	30.0	5.2	0.0
	South (180°)	49.6	44.2	37.1	33.1	25.3	18.3	0.0	0.0
	East (90°)	50.7	45.1	40.0	37.0	30.2	19.0	0.0	0.0
	North (0°)	45.3	54.8	49.6	44.0	40.4	30.1	5.2	0.0
135	West (270°)	53.8	49.1	45.7	43.1	41.0	29.9	5.7	0.0
	South (180°)	50.2	45.0	37.6	33.7	26.3	19.9	0.0	0.0
	East (90°)	51.7	46.2	39.9	37.4	31.7	22.2	0.0	0.0
	North (0°)	45.8	55.2	50.2	44.4	41.2	31.5	8.0	0.0
136	West (270°)	52.5	46.9	42.9	40.1	34.4	22.2	0.0	0.0
	South (180°)	50.5	45.2	38.8	35.1	27.5	19.5	0.0	0.0
	East (90°)	54.3	49.2	45.2	42.9	40.2	30.8	6.9	0.0
	North (0°)	45.8	55.2	50.1	44.4	41.1	31.1	6.9	0.0

137	West (270°)	52.0	46.5	42.8	39.8	35.0	21.1	0.0	0.0
	South (180°)	50.2	44.6	38.9	35.2	27.8	17.6	0.0	0.0
	East (90°)	53.8	48.6	44.9	42.5	39.2	28.9	2.9	0.0
	North (0°)	45.3	54.8	49.5	44.1	40.3	29.4	3.0	0.0
138	West (270°)	51.8	46.3	43.0	40.1	35.3	20.8	0.0	0.0
	South (180°)	50.0	44.2	39.2	36.0	28.2	16.0	0.0	0.0
	East (90°)	53.1	47.7	44.2	41.8	38.0	26.8	0.0	0.0
	North (0°)	44.7	54.3	48.9	43.7	39.5	27.7	0.0	0.0
139	West (270°)	49.6	43.2	41.0	38.2	31.1	11.8	0.0	0.0
	South (180°)	47.1	40.5	36.7	33.7	26.1	6.7	0.0	0.0
	East (90°)	48.9	42.5	40.0	37.0	30.3	11.7	0.0	0.0
	North (0°)	40.3	50.7	44.7	40.0	33.3	13.9	0.0	0.0
140	West (270°)	48.2	41.9	39.9	37.2	30.7	11.8	0.0	0.0
	South (180°)	45.9	39.6	36.8	34.0	27.0	7.8	0.0	0.0
	East (90°)	46.2	39.7	36.8	33.9	26.8	6.7	0.0	0.0
	North (0°)	38.1	48.4	42.4	37.9	30.9	11.5	0.0	0.0
141	West (270°)	49.0	42.8	41.0	38.2	30.9	10.9	0.0	0.0
	South (180°)	44.1	37.3	30.7	26.0	15.9	0.0	0.0	0.0
	East (90°)	47.2	40.9	38.3	35.1	26.4	3.1	0.0	0.0
	North (0°)	39.9	50.2	44.2	39.8	32.1	11.3	0.0	0.0
142	West (270°)	50.7	44.9	42.9	40.2	34.9	18.3	0.0	0.0
	South (180°)	45.6	39.1	32.2	27.8	18.9	6.7	0.0	0.0
	East (90°)	47.9	41.5	37.9	34.8	26.8	8.7	0.0	0.0
	North (0°)	41.8	51.7	45.8	41.4	35.3	18.8	0.0	0.0
143	West (270°)	50.2	44.1	42.2	39.6	33.1	15.3	0.0	0.0
	South (180°)	45.7	38.9	32.2	28.5	20.3	4.9	0.0	0.0
	East (90°)	48.0	41.8	39.1	36.0	27.8	6.9	0.0	0.0
	North (0°)	40.9	51.0	45.1	40.6	34.1	15.1	0.0	0.0
144	West (270°)	47.9	41.6	39.0	35.9	27.8	5.6	0.0	0.0
	South (180°)	45.9	39.3	35.0	31.4	22.2	0.4	0.0	0.0
	East (90°)	49.4	43.4	41.5	38.5	31.2	9.5	0.0	0.0
	North (0°)	40.1	50.4	44.4	39.9	32.4	10.9	0.0	0.0
145	West (270°)	49.2	43.1	41.2	38.4	31.2	11.5	0.0	0.0
	South (180°)	44.6	37.8	31.2	26.8	17.1	0.3	0.0	0.0
	East (90°)	47.8	41.5	39.1	36.1	27.9	5.7	0.0	0.0
	North (0°)	40.3	50.6	44.6	40.2	32.8	12.3	0.0	0.0
146	West (270°)	50.0	43.9	42.0	39.3	32.6	14.4	0.0	0.0
	South (180°)	45.6	38.7	32.1	28.4	19.9	4.0	0.0	0.0
	East (90°)	48.2	41.9	39.4	36.4	28.4	7.4	0.0	0.0
	North (0°)	40.9	51.0	45.1	40.5	33.9	14.5	0.0	0.0

147	West (270°)	50.6	44.6	42.4	39.7	33.5	16.7	0.0	0.0
	South (180°)	47.2	40.2	34.4	30.7	24.1	7.8	0.0	0.0
	East (90°)	49.9	43.8	41.4	38.6	31.6	13.2	0.0	0.0
	North (0°)	41.7	52.0	45.9	41.3	35.1	17.7	0.0	0.0
148	West (270°)	50.0	44.0	40.8	37.6	31.8	14.7	0.0	0.0
	South (180°)	49.6	43.5	40.0	36.8	29.5	12.9	0.0	0.0
	East (90°)	52.8	46.9	44.6	42.0	36.4	22.2	0.0	0.0
	North (0°)	43.0	53.0	47.2	42.4	36.9	22.6	0.0	0.0
149	West (270°)	47.3	40.7	37.9	34.8	26.9	4.4	0.0	0.0
	South (180°)	45.4	39.1	34.9	31.0	22.9	0.0	0.0	0.0
	East (90°)	49.0	42.7	40.8	37.9	30.3	8.8	0.0	0.0
	North (0°)	39.5	49.9	43.9	39.4	31.8	10.0	0.0	0.0
150	West (270°)	46.9	40.4	37.6	34.4	26.2	2.9	0.0	0.0
	South (180°)	45.2	38.9	34.9	31.0	23.1	0.0	0.0	0.0
	East (90°)	48.8	42.5	40.6	37.6	29.9	7.6	0.0	0.0
	North (0°)	39.1	49.6	43.6	39.0	31.1	8.5	0.0	0.0
151	West (270°)	47.8	41.7	38.9	35.5	28.0	6.1	0.0	0.0
	South (180°)	46.7	40.2	36.3	33.1	25.0	4.8	0.0	0.0
	East (90°)	50.3	44.2	42.3	39.6	32.6	13.5	0.0	0.0
	North (0°)	40.6	50.9	44.9	40.4	33.3	13.8	0.0	0.0
152	West (270°)	47.6	41.0	38.2	35.1	27.4	5.7	0.0	0.0
	South (180°)	45.9	39.3	35.2	31.8	22.9	1.3	0.0	0.0
	East (90°)	49.4	43.0	41.1	38.2	30.9	10.2	0.0	0.0
	North (0°)	39.9	50.2	44.2	39.8	32.4	11.5	0.0	0.0
153	West (270°)	45.4	39.0	36.6	33.4	24.6	0.0	0.0	0.0
	South (180°)	42.9	35.7	30.0	25.5	17.0	0.0	0.0	0.0
	East (90°)	46.6	40.6	38.7	35.3	26.4	0.0	0.0	0.0
	North (0°)	36.9	47.8	41.6	36.8	28.0	1.8	0.0	0.0
154	West (270°)	45.6	39.2	36.8	33.6	24.9	0.0	0.0	0.0
	South (180°)	43.7	37.5	33.8	29.7	21.2	0.0	0.0	0.0
	East (90°)	46.9	40.9	39.0	35.7	27.0	0.7	0.0	0.0
	North (0°)	37.1	47.9	41.8	37.0	28.3	2.6	0.0	0.0
155	West (270°)	45.8	39.5	37.2	34.1	25.7	1.6	0.0	0.0
	South (180°)	43.5	37.2	33.4	29.2	20.2	0.0	0.0	0.0
	East (90°)	46.6	40.6	38.6	35.2	26.3	0.0	0.0	0.0
	North (0°)	37.1	47.9	41.8	37.1	28.4	3.2	0.0	0.0
156	West (270°)	46.8	40.5	38.4	35.4	27.0	3.2	0.0	0.0
	South (180°)	43.3	36.2	30.2	25.6	16.2	0.0	0.0	0.0
	East (90°)	46.6	40.5	38.3	34.9	25.7	0.0	0.0	0.0
	North (0°)	37.7	48.6	42.4	37.7	29.0	4.2	0.0	0.0

157	West (270°)	46.9	40.7	38.7	35.8	27.6	4.7	0.0	0.0
	South (180°)	42.3	35.4	28.7	23.8	13.0	0.0	0.0	0.0
	East (90°)	45.6	39.5	37.1	33.5	24.3	0.0	0.0	0.0
	North (0°)	37.7	48.4	42.3	37.7	29.2	5.2	0.0	0.0
158	West (270°)	45.8	39.5	37.0	33.9	25.4	0.9	0.0	0.0
	South (180°)	43.9	37.6	33.9	29.8	21.2	0.0	0.0	0.0
	East (90°)	47.1	41.1	39.2	35.9	27.4	1.7	0.0	0.0
	North (0°)	37.4	48.2	42.0	37.4	28.8	3.8	0.0	0.0
159	West (270°)	45.8	39.4	36.8	33.7	25.0	0.2	0.0	0.0
	South (180°)	44.1	37.8	34.2	30.2	22.0	0.0	0.0	0.0
	East (90°)	47.4	41.4	39.6	36.4	28.1	3.3	0.0	0.0
	North (0°)	37.6	48.3	42.2	37.5	29.1	4.4	0.0	0.0
160	West (270°)	46.2	39.8	37.1	34.0	25.4	1.1	0.0	0.0
	South (180°)	44.6	38.3	34.4	30.3	22.1	0.0	0.0	0.0
	East (90°)	48.2	42.2	40.4	37.2	29.0	4.5	0.0	0.0
	North (0°)	38.3	49.0	42.9	38.3	29.9	5.6	0.0	0.0
161	West (270°)	46.2	40.0	37.3	34.2	25.7	1.9	0.0	0.0
	South (180°)	43.6	38.4	34.4	30.4	21.9	0.0	0.0	0.0
	East (90°)	47.9	42.4	40.6	37.5	29.3	5.3	0.0	0.0
	North (0°)	38.6	49.1	43.1	38.6	30.3	6.5	0.0	0.0
162	West (270°)	45.5	39.6	38.0	34.8	26.7	3.1	0.0	0.0
	South (180°)	39.6	32.7	26.0	21.2	10.5	0.0	0.0	0.0
	East (90°)	39.9	32.9	26.4	22.3	12.4	0.0	0.0	0.0
	North (0°)	35.1	45.6	39.6	35.0	26.7	3.2	0.0	0.0
163	West (270°)	46.6	40.0	37.3	34.0	25.6	1.4	0.0	0.0
	South (180°)	44.8	38.6	34.7	30.7	22.9	0.0	0.0	0.0
	East (90°)	48.4	42.1	40.2	37.2	29.1	5.9	0.0	0.0
	North (0°)	38.6	49.3	43.1	38.6	30.3	6.7	0.0	0.0
164	West (270°)	46.3	39.7	36.9	33.6	24.9	0.0	0.0	0.0
	South (180°)	44.6	38.4	34.7	30.7	23.0	0.0	0.0	0.0
	East (90°)	48.1	41.8	39.9	36.8	28.6	4.7	0.0	0.0
	North (0°)	38.1	48.9	42.8	38.1	29.6	5.1	0.0	0.0
165	West (270°)	45.8	39.2	36.7	33.4	24.6	0.0	0.0	0.0
	South (180°)	44.0	37.8	34.3	30.3	22.4	0.0	0.0	0.0
	East (90°)	47.0	40.7	38.7	35.6	27.2	2.5	0.0	0.0
	North (0°)	37.2	48.0	41.8	37.1	28.4	3.1	0.0	0.0
166	West (270°)	55.9	50.9	46.3	43.9	40.8	31.7	8.1	0.0
	South (180°)	56.5	51.9	48.1	45.6	43.9	33.1	8.8	0.0
	East (90°)	56.7	51.6	47.7	45.2	41.7	32.2	8.4	0.0
	North (0°)	42.2	54.9	49.5	41.0	35.5	25.3	0.4	0.0

167	West (270°)	53.8	48.5	45.3	42.5	39.3	26.5	0.0	0.0
	South (180°)	55.4	50.2	47.4	44.8	40.7	28.6	0.9	0.0
	East (90°)	54.4	48.7	45.7	43.1	37.3	23.2	0.0	0.0
	North (0°)	40.3	52.7	46.7	39.8	32.7	18.3	0.0	0.0
168	West (270°)	55.7	50.2	46.8	44.0	39.1	26.3	0.0	0.0
	South (180°)	56.0	50.4	47.0	44.4	39.3	26.5	0.0	0.0
	East (90°)	57.1	51.7	48.6	46.2	41.9	30.3	1.6	0.0
	North (0°)	46.8	56.6	51.3	45.6	41.9	29.6	0.2	0.0
169	West (270°)	57.2	51.9	48.5	46.0	42.1	31.9	8.0	0.0
	South (180°)	56.7	51.7	48.3	45.7	42.9	32.0	6.9	0.0
	East (90°)	55.4	50.0	45.8	43.1	38.9	28.5	1.9	0.0
	North (0°)	43.5	55.3	49.7	42.6	36.9	25.0	0.0	0.0
170	West (270°)	56.5	51.2	48.0	45.5	41.7	31.6	7.9	0.0
	South (180°)	55.3	50.2	46.7	44.1	41.5	30.1	5.6	0.0
	East (90°)	54.4	48.8	44.9	42.3	37.2	24.6	0.0	0.0
	North (0°)	44.3	55.3	49.7	43.5	38.1	25.1	0.0	0.0
171	West (270°)	56.3	50.8	47.9	45.4	40.8	28.8	0.0	0.0
	South (180°)	55.1	49.5	46.0	43.3	38.7	26.7	0.0	0.0
	East (90°)	55.0	49.5	45.8	43.1	38.9	28.0	0.6	0.0
	North (0°)	46.2	56.2	50.8	45.1	41.0	29.6	1.5	0.0
172	West (270°)	53.9	49.1	45.0	42.4	40.7	30.1	6.2	0.0
	South (180°)	53.2	47.7	43.4	40.6	34.9	22.9	0.0	0.0
	East (90°)	54.6	49.0	45.4	42.8	37.3	24.5	0.0	0.0
	North (0°)	46.1	55.7	50.6	44.7	41.3	31.8	8.6	0.0
173	West (270°)	50.4	44.2	39.5	36.6	29.4	15.7	0.0	0.0
	South (180°)	51.9	46.2	43.0	40.3	35.5	22.5	0.0	0.0
	East (90°)	53.6	48.2	45.7	43.1	38.9	25.0	0.0	0.0
	North (0°)	42.8	53.1	47.3	42.1	36.9	23.6	0.0	0.0
174	West (270°)	56.6	51.3	47.7	45.2	41.7	31.8	8.0	0.0
	South (180°)	56.6	51.3	47.5	45.1	41.8	31.9	8.0	0.0
	East (90°)	55.9	50.4	46.9	44.3	39.5	27.8	0.0	0.0
	North (0°)	45.0	55.6	50.2	43.9	39.4	26.6	0.0	0.0
175	West (270°)	53.9	48.0	44.9	42.3	37.2	23.1	0.0	0.0
	South (180°)	54.1	48.3	45.4	42.7	37.5	23.7	0.0	0.0
	East (90°)	55.1	49.4	46.8	44.2	39.1	25.7	0.0	0.0
	North (0°)	44.6	54.9	49.2	43.9	38.8	25.4	0.0	0.0
176	West (270°)	53.2	47.8	44.0	41.4	35.3	21.0	0.0	0.0
	South (180°)	54.8	49.3	46.2	43.6	39.1	27.0	0.0	0.0
	East (90°)	55.8	50.4	47.8	45.1	40.9	28.2	0.0	0.0
	North (0°)	44.7	54.8	49.5	44.0	38.6	25.5	0.0	0.0

177	West (270°)	55.3	49.7	46.7	44.0	39.3	26.5	0.0	0.0
	South (180°)	55.8	50.2	47.1	44.7	40.4	28.3	0.0	0.0
	East (90°)	55.5	49.8	46.9	44.3	39.3	26.1	0.0	0.0
	North (0°)	44.3	55.1	49.3	43.7	37.8	22.8	0.0	0.0
178	West (270°)	50.6	45.3	38.7	35.3	28.7	20.3	0.0	0.0
	South (180°)	52.4	48.3	44.3	41.4	40.4	29.8	5.9	0.0
	East (90°)	54.6	49.9	46.4	43.8	40.7	31.5	8.2	0.0
	North (0°)	41.2	52.6	47.5	40.5	34.2	22.8	0.0	0.0
179	West (270°)	48.2	42.4	36.1	32.3	24.3	14.7	0.0	0.0
	South (180°)	49.2	43.3	37.4	34.4	28.3	17.1	0.0	0.0
	East (90°)	53.1	47.8	45.0	42.4	38.2	26.7	0.0	0.0
	North (0°)	42.8	52.2	47.0	41.5	38.1	25.1	0.0	0.0
180	West (270°)	57.5	52.6	48.5	46.2	43.5	34.4	11.1	0.0
	South (180°)	56.2	51.2	46.7	44.2	41.2	31.8	8.1	0.0
	East (90°)	55.7	50.3	46.2	43.5	38.1	26.1	0.0	0.0
	North (0°)	47.0	57.0	51.9	45.6	42.0	32.2	8.5	0.0
181	West (270°)	55.6	49.9	45.5	42.5	35.9	23.8	0.0	0.0
	South (180°)	56.7	51.4	47.3	44.8	40.9	31.0	6.6	0.0
	East (90°)	58.2	53.1	49.5	47.1	44.0	34.3	10.6	0.0
	North (0°)	47.4	57.5	52.3	46.2	42.3	32.2	8.7	0.0
182	West (270°)	56.7	51.3	47.7	45.2	40.8	29.2	0.1	0.0
	South (180°)	56.3	50.9	47.2	44.6	40.3	28.9	0.1	0.0
	East (90°)	56.6	51.4	47.3	44.8	41.6	32.1	8.7	0.0
	North (0°)	47.3	57.1	52.0	45.9	42.4	32.5	8.8	0.0
183	West (270°)	55.1	49.5	46.2	43.5	37.9	25.0	0.0	0.0
	South (180°)	55.2	50.2	46.7	44.1	41.6	30.3	5.8	0.0
	East (90°)	55.7	50.6	46.7	44.2	41.3	31.7	8.1	0.0
	North (0°)	43.8	55.1	49.5	43.0	37.5	25.4	0.0	0.0
184	West (270°)	54.6	49.0	46.2	43.6	38.5	26.0	0.0	0.0
	South (180°)	52.8	47.0	43.2	40.2	36.6	23.6	0.0	0.0
	East (90°)	53.5	47.9	44.5	42.0	37.6	24.8	0.0	0.0
	North (0°)	44.0	54.7	48.7	43.3	38.2	24.9	0.0	0.0
185	West (270°)	54.7	49.0	46.2	43.6	38.1	24.6	0.0	0.0
	South (180°)	54.1	48.5	45.2	42.6	38.0	25.4	0.0	0.0
	East (90°)	54.5	49.1	45.5	43.1	39.4	28.1	0.0	0.0
	North (0°)	44.9	55.0	49.5	43.9	39.5	27.6	0.0	0.0
186	West (270°)	45.0	38.9	37.2	34.3	26.3	3.5	0.0	0.0
	South (180°)	40.4	33.3	26.8	23.3	14.4	0.0	0.0	0.0
	East (90°)	41.7	35.7	32.5	28.4	19.3	0.0	0.0	0.0
	North (0°)	34.9	45.4	39.6	34.6	27.0	2.6	0.0	0.0

187	West (270°)	45.0	38.7	31.4	27.4	19.1	9.2	0.0	0.0
	South (180°)	45.0	38.7	31.5	27.6	19.4	9.2	0.0	0.0
	East (90°)	50.7	45.1	42.9	40.3	35.2	21.3	0.0	0.0
	North (0°)	40.9	50.7	45.0	40.3	35.2	21.3	0.0	0.0
188	West (270°)	53.7	48.4	44.3	41.8	37.4	26.2	0.0	0.0
	South (180°)	50.9	45.6	37.0	33.0	25.7	20.9	0.0	0.0
	East (90°)	55.0	50.0	45.9	43.5	40.7	31.7	8.6	0.0
	North (0°)	46.9	56.3	51.3	45.5	42.3	32.5	8.7	0.0
189	West (270°)	42.9	35.9	29.2	25.8	17.8	1.1	0.0	0.0
	South (180°)	42.3	35.5	28.8	24.6	15.0	0.0	0.0	0.0
	East (90°)	47.8	41.9	40.3	37.2	30.5	9.6	0.0	0.0
	North (0°)	37.9	48.1	42.2	37.7	30.5	10.8	0.0	0.0
190	West (270°)	41.7	34.9	28.2	23.5	13.6	0.0	0.0	0.0
	South (180°)	41.8	35.0	28.4	24.0	14.2	0.0	0.0	0.0
	East (90°)	47.8	41.7	40.1	37.3	29.8	9.7	0.0	0.0
	North (0°)	37.4	47.7	41.7	37.2	29.8	9.7	0.0	0.0
191	West (270°)	44.8	37.5	32.7	29.2	24.0	7.0	0.0	0.0
	South (180°)	43.2	36.5	29.8	25.7	16.6	0.9	0.0	0.0
	East (90°)	48.4	41.9	40.1	37.2	30.3	10.5	0.0	0.0
	North (0°)	38.9	49.0	43.1	38.7	32.0	12.8	0.0	0.0
192	West (270°)	39.2	33.8	27.2	22.5	12.5	0.0	0.0	0.0
	South (180°)	39.2	33.8	27.2	22.5	12.5	0.0	0.0	0.0
	East (90°)	45.3	40.7	39.1	36.3	28.7	8.3	0.0	0.0
	North (0°)	36.4	45.3	40.7	36.3	28.7	8.3	0.0	0.0
193	West (270°)	40.4	33.6	27.0	22.3	12.3	0.0	0.0	0.0
	South (180°)	40.4	33.6	27.0	22.3	12.3	0.0	0.0	0.0
	East (90°)	46.5	40.5	38.9	36.1	28.5	7.8	0.0	0.0
	North (0°)	36.2	46.5	40.5	36.1	28.5	7.8	0.0	0.0
194	West (270°)	40.1	33.3	26.7	21.9	11.8	0.0	0.0	0.0
	South (180°)	40.1	33.3	26.7	21.9	11.8	0.0	0.0	0.0
	East (90°)	46.3	40.2	38.6	35.8	28.0	6.8	0.0	0.0
	North (0°)	35.8	46.3	40.2	35.8	28.0	6.8	0.0	0.0
195	West (270°)	48.4	42.2	38.1	35.2	28.5	12.6	0.0	0.0
	South (180°)	46.7	40.4	33.2	28.9	20.4	10.2	0.0	0.0
	East (90°)	52.1	46.4	44.1	41.6	36.5	22.1	0.0	0.0
	North (0°)	42.9	52.7	46.9	42.4	37.0	22.3	0.0	0.0
196	West (270°)	47.6	41.2	37.7	34.8	27.9	10.5	0.0	0.0
	South (180°)	45.5	39.0	32.1	27.7	18.8	6.6	0.0	0.0
	East (90°)	50.9	45.0	43.0	40.3	34.5	18.3	0.0	0.0
	North (0°)	41.7	51.6	45.7	41.3	35.3	18.7	0.0	0.0

197	West (270°)	51.0	45.0	42.8	40.0	33.3	16.0	0.0	0.0
	South (180°)	47.6	41.4	37.1	33.4	27.1	9.1	0.0	0.0
	East (90°)	50.1	44.0	41.4	38.8	33.1	17.4	0.0	0.0
	North (0°)	42.2	52.2	46.3	41.8	35.7	19.3	0.0	0.0
198	West (270°)	52.2	46.4	44.1	41.4	35.4	20.2	0.0	0.0
	South (180°)	48.5	42.4	37.7	34.1	27.9	11.4	0.0	0.0
	East (90°)	50.8	44.8	41.9	39.3	33.8	18.5	0.0	0.0
	North (0°)	43.3	53.3	47.4	42.8	37.2	22.1	0.0	0.0
199	West (270°)	50.9	44.9	42.9	40.1	33.5	16.0	0.0	0.0
	South (180°)	47.0	40.1	34.4	30.5	24.1	7.8	0.0	0.0
	East (90°)	49.3	43.0	40.4	37.6	31.2	13.8	0.0	0.0
	North (0°)	41.6	51.9	45.8	41.3	34.9	17.5	0.0	0.0
200	West (270°)	54.9	49.9	46.1	43.7	40.8	31.5	8.3	0.0
	South (180°)	50.0	44.7	36.1	32.0	24.5	20.0	0.0	0.0
	East (90°)	51.3	46.0	40.8	37.4	30.7	20.3	0.0	0.0
	North (0°)	45.9	55.4	50.3	44.5	41.1	31.6	8.3	0.0
201	West (270°)	49.4	43.4	40.5	37.7	30.8	14.5	0.0	0.0
	South (180°)	46.3	40.2	32.8	28.4	20.1	11.1	0.0	0.0
	East (90°)	50.9	45.3	42.5	40.0	35.6	23.0	0.0	0.0
	North (0°)	42.5	52.3	46.6	41.8	36.7	23.3	0.0	0.0
202	West (270°)	50.1	44.1	42.0	39.3	33.7	18.6	0.0	0.0
	South (180°)	44.4	38.2	31.3	26.7	17.7	6.5	0.0	0.0
	East (90°)	45.6	39.5	35.5	31.5	23.2	7.4	0.0	0.0
	North (0°)	40.7	50.5	44.8	40.3	34.2	18.7	0.0	0.0
203	West (270°)	50.9	45.2	43.2	40.6	35.6	20.3	0.0	0.0
	South (180°)	50.1	44.4	42.2	39.5	35.1	19.4	0.0	0.0
	East (90°)	45.8	39.3	32.2	28.8	21.3	9.2	0.0	0.0
	North (0°)	34.6	47.3	41.1	33.7	27.8	11.5	0.0	0.0
204	West (270°)	52.2	46.6	43.9	41.5	37.0	24.5	0.0	0.0
	South (180°)	52.0	46.4	43.7	41.3	36.8	24.4	0.0	0.0
	East (90°)	47.9	42.2	37.7	34.2	28.8	13.9	0.0	0.0
	North (0°)	36.2	48.2	42.5	34.9	30.2	14.9	0.0	0.0
205	West (270°)	49.7	43.7	42.0	39.4	33.0	15.4	0.0	0.0
	South (180°)	48.6	42.7	40.8	37.9	32.5	14.4	0.0	0.0
	East (90°)	43.5	36.9	30.2	25.7	16.6	3.3	0.0	0.0
	North (0°)	33.0	45.6	39.3	32.2	25.5	6.3	0.0	0.0
206	West (270°)	53.6	48.1	45.4	42.6	37.7	23.0	0.0	0.0
	South (180°)	54.1	48.6	45.5	43.1	39.0	27.5	0.0	0.0
	East (90°)	53.0	47.5	43.4	41.0	37.7	27.1	0.0	0.0
	North (0°)	41.7	52.6	47.0	40.9	35.8	22.7	0.0	0.0

207	West (270°)	54.0	47.7	45.2	42.5	36.5	21.0	0.0	0.0
	South (180°)	53.8	48.0	45.3	42.6	37.2	22.7	0.0	0.0
	East (90°)	53.2	46.9	43.7	41.0	36.4	22.6	0.0	0.0
	North (0°)	42.9	53.4	47.6	42.2	37.1	22.1	0.0	0.0
208	West (270°)	54.0	48.5	45.1	42.5	37.0	24.6	0.0	0.0
	South (180°)	55.0	49.9	46.0	43.6	40.7	31.5	8.1	0.0
	East (90°)	54.3	49.4	44.9	42.6	40.3	31.4	8.1	0.0
	North (0°)	42.0	53.1	47.8	41.0	36.0	24.3	0.0	0.0
209	West (270°)	52.8	47.9	44.9	42.2	39.4	27.6	1.3	0.0
	South (180°)	49.8	44.0	38.7	35.3	27.9	17.6	0.0	0.0
	East (90°)	49.5	43.9	35.6	33.0	27.5	19.6	0.0	0.0
	North (0°)	43.7	53.3	48.2	42.2	39.1	29.1	3.6	0.0
210	West (270°)	49.4	43.5	41.9	39.0	32.4	12.1	0.0	0.0
	South (180°)	47.3	41.0	38.7	35.8	28.3	7.6	0.0	0.0
	East (90°)	44.2	37.3	30.7	27.1	19.0	2.7	0.0	0.0
	North (0°)	37.3	48.0	41.7	36.9	30.3	11.7	0.0	0.0
211	West (270°)	50.8	45.5	43.6	40.7	35.6	19.6	0.0	0.0
	South (180°)	47.8	42.2	38.9	35.8	27.6	9.9	0.0	0.0
	East (90°)	46.4	40.1	32.9	29.8	23.0	11.2	0.0	0.0
	North (0°)	40.7	50.4	45.0	39.9	35.0	20.8	0.0	0.0
212	West (270°)	51.0	45.2	43.2	40.6	35.0	20.3	0.0	0.0
	South (180°)	47.3	41.1	37.7	34.6	26.4	9.1	0.0	0.0
	East (90°)	45.0	38.6	31.5	27.1	18.4	8.1	0.0	0.0
	North (0°)	40.1	50.0	44.3	39.4	34.5	20.2	0.0	0.0
213	West (270°)	53.4	47.7	45.3	42.9	38.1	25.0	0.0	0.0
	South (180°)	52.5	46.9	44.1	41.8	37.5	24.9	0.0	0.0
	East (90°)	48.3	42.4	36.9	33.0	25.8	13.0	0.0	0.0
	North (0°)	38.6	50.2	44.3	38.1	30.9	14.5	0.0	0.0
214	West (270°)	52.4	46.6	44.5	42.0	36.7	22.2	0.0	0.0
	South (180°)	50.9	45.3	42.8	40.1	36.1	21.2	0.0	0.0
	East (90°)	47.4	41.3	36.3	32.4	25.1	10.4	0.0	0.0
	North (0°)	37.9	49.8	43.7	37.6	30.1	13.0	0.0	0.0
215	West (270°)	48.5	42.6	41.0	38.1	31.2	11.8	0.0	0.0
	South (180°)	46.2	39.9	37.4	34.8	28.3	10.1	0.0	0.0
	East (90°)	42.7	35.9	29.3	25.1	15.7	0.0	0.0	0.0
	North (0°)	35.8	46.7	40.7	35.4	28.5	6.9	0.0	0.0

Noise Impacts Under Average Summer Conditions									
Client:	Wildcat Wind Farm, LLC	Manufacture:	GE	Summer Temperature:		22°C			
Project Name:	WildCat Wind Farm	Wind Turbine Model:	1.6xle	Summer Humidity:		67%			
Project Number:	CO001397.0003	Hub Height:	100 meters	Ground Absorption:		100%			
Project Location:	Madison County	Number of Blades:	3	Modeled Wind speed (m/s):		10 m/s			
Date:	7/14/2011	Number of Turbines:	127	Modeled Receiver Height:		1.52 m			
Madison County Noise Limits									
Frequency (Hz)		63	125	250	500	1000	2000	4000	
Noise Limit Level (dB)		75	70	65	59	53	48	44	
Worst-Case Wind Turbine Noise Impacts to Residential Receptor Points									
Receiver Number	Wind Direction	Sound Pressure Level (dB) Octave Bands (Hz)							
		63	125	250	500	1000	2000	4000	8000
1	West (270°)	54.7	48.3	42.9	40.6	39.5	34.2	22.1	0.8
	South (180°)	55.3	48.9	44.0	41.7	40.4	34.9	22.6	0.8
	East (90°)	51.4	44.9	38.4	35.4	34.1	27.4	12.8	0.0
	North (0°)	50.3	43.6	34.6	30.5	25.0	23.3	9.2	0.0
2	West (270°)	48.9	41.2	38.6	35.7	31.8	23.8	5.6	0.0
	South (180°)	51.1	43.5	40.4	37.8	34.8	27.6	11.7	0.0
	East (90°)	42.7	34.6	26.8	22.0	15.4	11.7	0.0	0.0
	North (0°)	42.7	34.6	26.8	22.0	15.4	11.7	0.0	0.0
3	West (270°)	54.7	48.1	43.5	41.3	39.7	33.8	20.9	0.0
	South (180°)	54.3	47.8	43.2	40.8	39.6	33.4	20.4	0.0
	East (90°)	49.1	42.3	32.5	28.6	22.9	21.8	7.0	0.0
	North (0°)	49.7	42.6	33.0	29.9	25.2	22.7	7.8	0.0
4	West (270°)	54.0	47.1	42.9	40.6	38.6	32.5	19.0	0.0
	South (180°)	53.5	46.8	42.5	40.0	38.6	32.0	18.5	0.0
	East (90°)	48.3	41.1	31.7	27.6	21.9	20.4	4.8	0.0
	North (0°)	48.9	41.5	32.2	29.1	24.4	21.4	5.8	0.0
5	West (270°)	50.8	43.0	40.0	37.4	34.2	26.9	10.6	0.0
	South (180°)	50.8	43.0	40.0	37.4	34.2	26.9	10.6	0.0
	East (90°)	44.7	36.5	28.4	23.9	17.6	14.7	0.0	0.0
	North (0°)	44.7	36.5	28.4	23.9	17.6	14.7	0.0	0.0
6	West (270°)	51.1	43.5	40.4	37.8	34.8	27.6	11.7	0.0
	South (180°)	51.1	43.5	40.4	37.8	34.8	27.6	11.7	0.0
	East (90°)	45.1	37.0	28.8	24.3	18.1	15.4	0.0	0.0
	North (0°)	45.1	37.0	28.8	24.3	18.1	15.4	0.0	0.0

7	West (270°)	50.3	42.5	39.6	36.9	33.6	26.1	9.5	0.0
	South (180°)	50.3	42.5	39.6	36.9	33.6	26.1	9.5	0.0
	East (90°)	44.3	36.0	27.9	23.4	17.0	13.9	0.0	0.0
	North (0°)	44.3	36.0	27.9	23.4	17.0	13.9	0.0	0.0
8	West (270°)	54.6	47.1	41.7	38.5	34.0	27.6	11.4	0.0
	South (180°)	56.2	49.1	44.4	41.7	39.1	33.0	19.5	0.0
	East (90°)	57.1	50.5	45.7	43.3	41.8	36.1	23.7	1.1
	North (0°)	55.9	49.2	43.9	41.4	39.9	34.3	22.0	0.4
9	West (270°)	56.0	48.8	44.7	42.1	39.9	33.5	20.0	0.0
	South (180°)	54.9	47.3	43.3	40.3	37.0	30.1	15.1	0.0
	East (90°)	52.7	45.2	40.0	36.1	32.8	25.2	7.9	0.0
	North (0°)	54.6	47.4	42.8	40.3	38.1	32.1	18.7	0.0
10	West (270°)	56.4	49.3	45.1	42.6	40.5	34.3	21.0	0.0
	South (180°)	55.4	48.0	43.9	41.0	38.1	31.5	17.3	0.0
	East (90°)	52.9	45.5	40.0	36.2	32.7	25.3	8.3	0.0
	North (0°)	54.7	47.7	42.8	40.3	38.2	32.2	19.0	0.0
11	West (270°)	57.9	51.4	46.4	44.1	42.7	37.3	25.1	3.5
	South (180°)	56.9	50.1	45.1	42.5	40.5	34.9	22.3	0.7
	East (90°)	54.5	47.5	41.2	37.7	33.3	27.6	12.4	0.0
	North (0°)	56.1	49.6	43.9	41.4	39.8	34.5	22.2	0.8
12	West (270°)	53.4	46.2	42.4	39.8	37.3	30.9	17.2	0.0
	South (180°)	50.5	42.7	37.5	34.1	29.3	22.6	6.2	0.0
	East (90°)	47.5	40.0	31.0	26.7	20.6	18.8	2.9	0.0
	North (0°)	51.4	44.6	40.4	37.7	36.9	29.3	14.9	0.0
13	West (270°)	52.7	44.7	42.0	38.9	34.7	26.2	7.2	0.0
	South (180°)	51.3	43.0	39.9	36.5	31.6	22.7	1.3	0.0
	East (90°)	48.0	39.4	34.0	30.0	24.3	16.8	0.0	0.0
	North (0°)	50.5	42.5	39.1	35.9	32.5	24.1	5.6	0.0
14	West (270°)	50.9	44.9	42.2	39.0	34.7	26.1	6.8	0.0
	South (180°)	50.8	43.2	40.1	36.5	31.9	22.6	0.9	0.0
	East (90°)	46.8	39.6	34.2	30.2	24.5	16.9	0.0	0.0
	North (0°)	46.9	42.6	39.3	36.3	32.2	24.2	5.5	0.0
15	West (270°)	53.6	45.7	42.9	39.8	36.0	27.5	8.9	0.0
	South (180°)	52.4	44.4	41.3	37.9	33.8	24.9	5.1	0.0
	East (90°)	49.2	40.5	34.8	31.0	25.5	18.4	0.0	0.0
	North (0°)	51.4	43.2	39.6	36.7	32.7	25.0	6.8	0.0
16	West (270°)	53.8	46.0	43.2	39.9	36.3	27.8	9.5	0.0
	South (180°)	52.8	44.7	41.7	38.3	34.2	25.4	5.9	0.0
	East (90°)	49.6	40.9	34.9	31.3	25.9	18.8	0.0	0.0
	North (0°)	51.7	43.5	39.8	36.9	33.1	25.4	7.5	0.0

		West (270°)	55.1	47.6	42.8	39.8	36.0	29.3	13.1	0.0
27	South (180°)	57.2	50.3	45.8	43.3	41.4	35.5	22.7	1.1	
	East (90°)	57.0	50.2	45.6	43.1	41.4	35.6	22.9	1.1	
	North (0°)	54.9	47.5	42.4	39.4	36.1	29.9	15.0	0.0	
	West (270°)	54.2	46.4	43.3	40.2	36.5	28.8	12.4	0.0	
28	South (180°)	54.0	46.2	43.0	40.1	36.7	29.1	12.9	0.0	
	East (90°)	50.9	42.7	38.0	34.7	30.8	23.6	6.1	0.0	
	North (0°)	51.2	43.0	38.6	34.8	30.4	21.9	1.3	0.0	
	West (270°)	55.2	47.6	44.2	41.2	38.0	30.9	16.0	0.0	
29	South (180°)	55.1	47.5	44.0	41.2	38.3	31.2	16.4	0.0	
	East (90°)	51.8	43.9	38.9	35.6	31.8	24.8	8.0	0.0	
	North (0°)	52.0	43.8	39.0	35.5	30.5	23.2	4.3	0.0	
	West (270°)	50.6	42.4	39.6	36.0	30.7	21.1	0.0	0.0	
30	South (180°)	49.7	41.5	38.5	34.9	29.9	20.3	0.0	0.0	
	East (90°)	46.5	38.2	33.7	29.5	25.9	16.3	0.0	0.0	
	North (0°)	48.3	40.0	36.5	32.7	27.8	18.2	0.0	0.0	
	West (270°)	53.0	44.9	42.3	39.1	34.7	26.1	6.3	0.0	
31	South (180°)	51.8	43.7	40.8	37.3	33.0	24.0	3.3	0.0	
	East (90°)	48.4	39.9	34.6	30.8	25.5	17.8	0.0	0.0	
	North (0°)	50.6	42.3	38.8	35.6	31.3	23.1	3.4	0.0	
	West (270°)	45.6	37.4	34.7	30.9	25.2	15.0	0.0	0.0	
32	South (180°)	44.6	36.4	33.5	29.7	24.2	14.3	0.0	0.0	
	East (90°)	39.5	30.5	22.7	17.0	9.0	3.1	0.0	0.0	
	North (0°)	42.1	33.6	29.7	25.2	18.7	8.3	0.0	0.0	
	West (270°)	48.8	40.6	37.9	34.2	28.7	18.8	0.0	0.0	
33	South (180°)	47.7	39.5	36.5	32.7	27.5	17.8	0.0	0.0	
	East (90°)	42.7	33.7	26.0	20.3	12.5	6.9	0.0	0.0	
	North (0°)	45.5	37.2	33.3	28.9	23.0	12.6	0.0	0.0	
	West (270°)	55.5	48.1	44.3	41.5	38.6	31.9	17.7	0.0	
34	South (180°)	55.7	48.5	44.7	41.9	40.0	32.8	18.4	0.0	
	East (90°)	53.5	46.1	41.2	38.3	35.8	29.5	15.5	0.0	
	North (0°)	52.7	44.9	39.2	35.6	31.2	24.5	7.5	0.0	
	West (270°)	55.4	47.8	44.3	41.4	38.3	31.3	16.8	0.0	
35	South (180°)	55.4	47.9	44.4	41.6	38.8	31.8	17.3	0.0	
	East (90°)	52.3	44.5	39.6	36.2	32.5	25.7	9.3	0.0	
	North (0°)	52.1	44.0	38.9	35.3	30.2	23.1	4.5	0.0	
	West (270°)	57.0	50.0	45.7	43.0	40.9	34.8	21.8	0.0	
36	South (180°)	56.8	49.5	45.3	42.5	40.2	33.8	19.6	0.0	
	East (90°)	54.7	47.4	42.0	39.1	36.2	30.2	16.1	0.0	
	North (0°)	54.4	46.9	41.2	37.8	35.4	29.6	15.1	0.0	

	West (270°)	56.2	48.9	44.8	42.0	39.3	32.8	18.8	0.0
37	South (180°)	56.6	49.6	45.6	42.9	41.0	34.1	20.3	0.0
	East (90°)	54.5	47.3	42.2	39.4	37.2	31.2	17.8	0.0
	North (0°)	53.2	45.5	39.2	35.6	31.1	25.0	8.8	0.0
	West (270°)	55.8	48.4	44.5	41.7	38.9	32.4	18.3	0.0
38	South (180°)	56.2	49.1	45.2	42.4	40.6	33.6	19.5	0.0
	East (90°)	54.0	46.8	41.9	39.0	36.7	30.5	16.9	0.0
	North (0°)	52.9	45.2	39.2	35.6	31.1	24.8	8.3	0.0
	West (270°)	55.4	47.6	42.9	40.0	36.7	30.1	14.3	0.0
39	South (180°)	55.3	47.7	43.1	40.0	36.3	29.4	13.5	0.0
	East (90°)	57.0	49.7	45.4	42.7	40.5	34.4	21.3	0.0
	North (0°)	57.1	50.0	45.7	43.1	40.9	34.8	21.7	0.0
	West (270°)	54.9	47.2	42.9	40.2	37.0	30.2	14.7	0.0
40	South (180°)	55.0	47.4	43.2	40.3	37.2	30.4	15.1	0.0
	East (90°)	55.9	48.5	44.7	41.8	39.2	32.0	17.2	0.0
	North (0°)	56.0	48.5	44.7	41.9	39.0	32.2	17.6	0.0
	West (270°)	56.3	49.3	44.9	42.0	40.7	33.6	19.9	0.0
41	South (180°)	55.8	48.1	43.7	40.6	36.7	29.8	13.6	0.0
	East (90°)	56.4	48.8	44.4	41.5	38.1	30.9	15.1	0.0
	North (0°)	57.1	50.1	45.8	43.1	41.2	35.0	22.0	0.0
	West (270°)	57.7	50.8	46.3	43.8	41.9	35.9	22.9	0.0
42	South (180°)	57.1	50.1	45.4	42.8	40.6	34.6	21.5	0.0
	East (90°)	55.5	48.2	43.0	40.1	37.1	31.0	16.7	0.0
	North (0°)	56.0	49.1	44.1	41.3	39.6	33.1	19.4	0.0
	West (270°)	57.3	50.2	45.8	43.2	41.0	34.9	21.6	0.0
43	South (180°)	57.1	50.0	45.4	42.8	40.5	34.4	20.9	0.0
	East (90°)	56.0	48.7	44.0	41.2	38.7	32.4	18.1	0.0
	North (0°)	56.0	48.9	44.2	41.4	39.5	32.7	18.3	0.0
	West (270°)	56.7	49.8	45.3	42.5	41.2	34.1	20.5	0.0
44	South (180°)	57.1	50.2	45.6	43.0	41.1	35.1	22.3	0.5
	East (90°)	55.2	48.3	42.6	39.8	38.3	31.4	17.3	0.0
	North (0°)	55.5	48.5	43.1	40.3	38.1	32.2	18.7	0.0
	West (270°)	56.2	49.2	45.0	42.4	40.3	34.1	21.1	0.0
45	South (180°)	55.1	47.6	43.6	40.8	37.4	30.5	15.0	0.0
	East (90°)	52.7	45.3	39.5	36.5	32.9	26.8	11.2	0.0
	North (0°)	54.5	47.7	42.5	40.0	38.5	32.9	20.4	0.0
	West (270°)	54.2	46.5	42.3	39.3	35.3	28.1	11.9	0.0
46	South (180°)	55.3	48.2	44.1	41.4	39.1	33.0	20.0	0.0
	East (90°)	53.0	46.3	41.4	38.5	38.2	30.9	17.5	0.0
	North (0°)	52.0	44.5	39.0	35.7	31.8	25.5	9.6	0.0

		West (270°)	56.0	48.7	44.8	42.1	39.5	32.8	18.7	0.0
47	South (180°)	56.3	49.2	45.1	42.6	40.4	34.1	20.4	0.0	
	East (90°)	54.0	46.7	41.5	39.0	36.7	30.8	17.1	0.0	
	North (0°)	53.3	45.7	40.4	37.3	33.9	27.6	11.9	0.0	
	West (270°)	56.0	48.7	44.9	42.3	39.8	33.2	19.3	0.0	
48	South (180°)	55.5	48.1	44.2	41.5	38.8	31.9	17.3	0.0	
	East (90°)	52.9	45.4	40.1	37.3	34.1	27.8	12.5	0.0	
	North (0°)	53.8	46.5	41.5	38.9	36.6	30.6	16.9	0.0	
	West (270°)	54.8	47.1	43.5	40.6	37.2	30.1	14.4	0.0	
49	South (180°)	55.1	47.7	44.0	41.2	38.5	31.7	17.4	0.0	
	East (90°)	53.2	46.0	41.2	38.5	36.4	30.2	16.6	0.0	
	North (0°)	52.6	45.1	40.2	37.2	34.2	27.7	12.7	0.0	
	West (270°)	54.2	46.5	42.9	40.0	36.5	29.3	13.5	0.0	
50	South (180°)	54.5	47.0	43.3	40.5	37.6	30.8	16.2	0.0	
	East (90°)	52.8	45.4	40.8	38.1	35.8	29.5	15.6	0.0	
	North (0°)	52.3	44.7	40.0	37.0	34.0	27.5	12.4	0.0	
	West (270°)	57.5	50.5	45.5	42.7	39.9	33.9	19.9	0.0	
51	South (180°)	57.8	51.0	45.8	43.2	41.5	35.7	22.9	1.3	
	East (90°)	58.3	51.8	46.5	44.2	42.9	37.6	25.4	4.3	
	North (0°)	58.0	51.3	46.0	43.5	41.9	36.4	23.9	2.0	
	West (270°)	58.0	51.1	46.2	43.6	41.6	35.8	23.0	1.1	
52	South (180°)	57.5	50.4	45.4	42.8	40.2	34.1	20.2	0.0	
	East (90°)	57.5	50.8	45.5	43.1	41.3	35.6	22.8	0.0	
	North (0°)	57.7	51.2	46.0	43.5	42.5	36.4	23.8	2.0	
	West (270°)	56.4	49.2	45.0	42.3	39.9	33.4	19.5	0.0	
53	South (180°)	56.3	49.5	45.3	42.6	41.7	34.4	20.4	0.0	
	East (90°)	55.0	48.0	42.6	40.2	38.4	32.8	19.8	0.0	
	North (0°)	54.3	46.8	40.7	37.7	34.0	27.8	12.2	0.0	
	West (270°)	56.1	48.9	44.8	42.1	39.7	33.1	19.1	0.0	
54	South (180°)	56.8	49.7	45.5	43.1	41.1	34.9	21.5	0.0	
	East (90°)	54.5	47.4	42.1	39.6	37.6	31.9	18.6	0.0	
	North (0°)	53.4	45.8	40.1	36.9	33.1	27.0	10.8	0.0	
	West (270°)	44.4	36.5	33.8	29.9	24.9	14.7	0.0	0.0	
55	South (180°)	44.7	36.5	33.9	30.2	24.8	15.0	0.0	0.0	
	East (90°)	39.1	29.9	22.4	17.7	10.8	3.8	0.0	0.0	
	North (0°)	38.5	29.6	21.9	16.4	8.7	3.1	0.0	0.0	
	West (270°)	44.3	36.4	33.7	29.8	24.7	14.3	0.0	0.0	
56	South (180°)	44.6	36.5	33.9	30.2	24.7	14.7	0.0	0.0	
	East (90°)	39.1	30.0	22.4	17.9	11.1	3.8	0.0	0.0	
	North (0°)	38.5	29.6	21.9	16.3	8.6	2.8	0.0	0.0	

		West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	West (270°)	43.1	35.6	32.6	28.0	23.3	11.4	0.0	0.0
58	South (180°)	43.8	35.6	32.9	29.0	23.2	12.8	0.0	0.0
	East (90°)	39.0	29.6	22.1	18.4	12.3	3.7	0.0	0.0
	North (0°)	37.7	28.7	20.9	15.2	7.1	0.9	0.0	0.0
	West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	West (270°)	48.0	39.8	36.3	32.7	27.6	18.9	0.0	0.0
61	South (180°)	50.3	42.3	39.5	36.5	32.5	24.4	6.4	0.0
	East (90°)	49.0	40.9	37.8	34.9	31.2	23.4	5.9	0.0
	North (0°)	45.3	37.0	31.2	26.3	20.2	13.1	0.0	0.0
	West (270°)	51.7	43.9	40.8	37.8	34.2	26.5	10.3	0.0
62	South (180°)	51.9	44.0	41.0	37.9	34.0	26.3	10.2	0.0
	East (90°)	48.1	39.8	34.9	31.0	25.2	17.3	0.0	0.0
	North (0°)	47.5	39.4	34.2	30.0	26.3	17.9	0.0	0.0
	West (270°)	48.0	39.7	34.2	30.8	25.7	18.9	1.1	0.0
63	South (180°)	51.2	43.6	40.3	37.6	34.7	27.7	12.6	0.0
	East (90°)	49.3	42.3	38.6	35.5	34.4	26.1	10.2	0.0
	North (0°)	45.2	37.2	28.8	24.3	18.0	15.5	0.0	0.0
	West (270°)	55.5	48.8	44.1	41.6	40.0	34.4	22.2	0.9
64	South (180°)	55.6	48.9	44.3	41.7	40.1	34.4	22.2	0.9
	East (90°)	51.6	44.4	37.7	34.0	28.6	23.9	9.2	0.0
	North (0°)	51.1	44.0	36.0	32.3	27.0	23.5	9.1	0.0
	West (270°)	53.7	47.1	42.6	40.3	38.6	32.7	19.8	0.0
65	South (180°)	53.7	47.1	42.6	40.3	38.6	32.7	19.8	0.0
	East (90°)	48.2	41.3	31.6	27.7	22.0	20.8	5.9	0.0
	North (0°)	48.2	41.3	31.6	27.7	22.0	20.8	5.9	0.0
	West (270°)	45.4	37.3	34.7	31.3	26.2	16.7	0.0	0.0
66	South (180°)	45.4	37.3	34.7	31.3	26.2	16.7	0.0	0.0
	East (90°)	39.3	30.4	22.8	17.5	10.0	4.8	0.0	0.0
	North (0°)	39.3	30.4	22.8	17.5	10.0	4.8	0.0	0.0

67	West (270°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	South (180°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	East (90°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	North (0°)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	West (270°)	41.9	33.4	29.8	25.7	19.5	8.9	0.0
	South (180°)	44.0	35.8	33.2	29.3	23.6	13.2	0.0
	East (90°)	41.7	34.0	30.7	26.3	21.9	10.5	0.0
	North (0°)	37.9	28.9	21.2	15.5	7.5	1.3	0.0
69	West (270°)	35.1	25.6	18.0	14.0	7.3	0.0	0.0
	South (180°)	39.9	31.7	28.9	24.6	18.2	6.9	0.0
	East (90°)	39.3	31.8	28.8	23.8	18.3	5.5	0.0
	North (0°)	33.9	24.8	16.9	10.7	2.2	0.0	0.0
70	West (270°)	56.3	49.3	43.6	40.8	37.7	31.9	17.5
	South (180°)	57.5	51.1	45.2	43.0	42.1	37.2	25.3
	East (90°)	58.2	52.0	46.5	44.2	43.2	38.1	26.2
	North (0°)	57.2	50.5	45.3	42.6	40.4	34.4	21.1
71	West (270°)	56.7	49.8	45.4	42.8	41.0	35.1	22.3
	South (180°)	55.2	48.4	43.1	40.5	39.1	33.6	21.2
	East (90°)	54.3	46.7	41.7	38.6	34.4	27.7	11.4
	North (0°)	56.1	48.7	44.6	41.7	38.6	31.8	17.1
72	West (270°)	56.0	48.9	44.7	42.1	39.8	33.6	20.2
	South (180°)	53.7	46.7	41.7	38.6	37.8	30.5	16.6
	East (90°)	54.1	46.4	41.9	38.8	34.8	27.8	11.0
	North (0°)	56.0	48.4	44.5	41.7	38.4	31.4	16.1
73	West (270°)	55.4	48.1	44.1	41.4	38.8	32.2	18.2
	South (180°)	53.2	46.0	41.2	38.0	36.8	29.2	14.7
	East (90°)	53.8	46.0	41.9	38.8	35.0	27.7	10.8
	North (0°)	55.6	47.9	44.2	41.4	37.9	30.6	14.7
74	West (270°)	55.2	47.9	43.0	40.1	36.6	29.9	15.0
	South (180°)	53.0	45.8	39.3	35.5	31.1	25.4	10.1
	East (90°)	55.1	48.5	43.6	41.0	40.3	33.4	20.4
	North (0°)	57.0	50.1	45.7	43.2	41.4	35.5	22.9
75	West (270°)	54.8	47.4	43.5	40.7	38.0	31.4	17.5
	South (180°)	52.0	44.0	38.3	34.7	29.8	23.1	6.4
	East (90°)	53.0	45.1	41.0	37.5	32.9	25.0	6.6
	North (0°)	55.0	47.6	44.2	41.1	38.7	30.8	15.6
76	West (270°)	55.1	47.6	43.8	40.9	38.0	31.1	16.4
	South (180°)	52.9	45.4	40.6	37.3	35.5	27.8	12.4
	East (90°)	54.1	46.4	42.4	39.4	36.0	28.8	12.6
	North (0°)	55.7	48.0	44.5	41.7	38.4	31.1	15.3

77	West (270°)	54.5	47.1	42.8	40.0	37.1	30.7	16.5	0.0
	South (180°)	52.1	44.6	38.8	35.3	30.8	24.5	7.6	0.0
	East (90°)	54.2	47.2	42.5	39.8	37.9	31.7	18.4	0.0
	North (0°)	55.9	48.8	44.7	42.2	40.1	33.8	20.4	0.0
78	West (270°)	54.9	47.7	42.7	39.8	36.4	29.8	15.2	0.0
	South (180°)	52.9	45.6	39.4	35.8	31.0	25.5	10.2	0.0
	East (90°)	54.4	48.0	42.9	40.1	39.9	33.0	20.1	0.0
	North (0°)	56.5	49.8	45.2	42.7	40.9	35.2	22.8	1.6
79	West (270°)	52.6	44.9	41.1	37.7	34.2	26.0	7.4	0.0
	South (180°)	54.0	46.6	42.9	40.2	37.4	30.5	16.0	0.0
	East (90°)	53.4	45.8	41.7	39.0	36.4	29.9	15.7	0.0
	North (0°)	52.0	44.1	40.0	36.5	32.4	24.5	6.0	0.0
80	West (270°)	53.6	46.5	41.2	38.1	33.9	27.3	12.2	0.0
	South (180°)	55.6	49.0	44.3	41.9	40.2	34.6	22.2	0.9
	East (90°)	53.8	47.8	43.0	40.2	39.9	32.9	19.9	0.0
	North (0°)	52.0	45.3	39.6	35.9	31.0	24.9	9.5	0.0
81	West (270°)	53.0	45.2	41.5	38.4	34.8	27.5	11.6	0.0
	South (180°)	53.9	46.3	42.9	40.1	37.1	30.0	14.9	0.0
	East (90°)	51.6	44.0	40.0	36.8	34.6	26.5	10.3	0.0
	North (0°)	50.6	42.5	37.7	33.9	28.1	20.6	0.7	0.0
82	West (270°)	52.7	44.6	41.4	38.1	34.0	25.9	8.9	0.0
	South (180°)	50.8	42.5	38.6	34.6	30.0	20.7	0.0	0.0
	East (90°)	51.6	43.4	39.9	36.1	31.2	22.1	1.1	0.0
	North (0°)	53.2	45.1	42.0	38.7	34.5	26.3	9.0	0.0
83	West (270°)	52.3	44.2	41.1	37.7	33.3	24.9	6.9	0.0
	South (180°)	50.7	42.5	38.8	35.0	30.5	21.1	0.0	0.0
	East (90°)	51.2	43.0	39.5	35.9	30.9	22.0	1.0	0.0
	North (0°)	52.6	44.5	41.4	38.0	33.6	25.1	7.0	0.0
84	West (270°)	53.0	45.0	41.7	38.4	34.4	26.5	9.9	0.0
	South (180°)	51.0	42.6	38.4	34.7	29.8	21.6	1.5	0.0
	East (90°)	51.8	43.7	40.1	36.6	32.0	23.2	2.9	0.0
	North (0°)	53.5	45.5	42.4	39.2	35.2	27.1	10.1	0.0
85	West (270°)	51.8	43.5	40.4	36.8	31.8	22.9	2.5	0.0
	South (180°)	50.7	42.1	38.4	34.7	30.0	21.2	0.0	0.0
	East (90°)	51.3	43.1	39.8	36.3	31.6	22.9	3.3	0.0
	North (0°)	52.2	43.8	40.7	37.1	32.3	23.4	3.0	0.0
86	West (270°)	53.1	45.5	42.2	39.1	36.4	28.3	12.2	0.0
	South (180°)	53.6	45.9	42.7	39.9	36.7	29.4	13.9	0.0
	East (90°)	50.9	42.6	37.9	34.6	30.0	22.5	3.8	0.0
	North (0°)	50.4	42.2	37.6	33.7	27.9	20.1	0.0	0.0

	West (270°)	53.0	45.4	42.1	38.9	36.2	28.1	11.9	0.0
87	South (180°)	53.6	45.9	42.7	39.8	36.6	29.4	13.8	0.0
	East (90°)	51.0	42.8	38.2	35.0	30.5	23.0	4.5	0.0
	North (0°)	50.3	42.2	37.5	33.6	27.8	20.0	0.0	0.0
	West (270°)	52.9	45.2	41.9	38.7	36.0	27.8	11.4	0.0
88	South (180°)	53.5	45.8	42.6	39.8	36.5	29.2	13.5	0.0
	East (90°)	51.0	42.8	38.4	35.2	30.8	23.2	4.9	0.0
	North (0°)	50.3	42.1	37.5	33.6	27.8	19.9	0.0	0.0
	West (270°)	52.6	45.0	41.6	38.4	35.8	27.5	11.1	0.0
89	South (180°)	53.4	45.6	42.4	39.7	36.4	29.1	13.4	0.0
	East (90°)	51.0	42.8	38.5	35.4	31.1	23.6	5.5	0.0
	North (0°)	50.2	42.0	37.4	33.5	27.7	19.8	0.0	0.0
	West (270°)	51.8	44.6	38.5	34.9	29.7	24.3	9.0	0.0
90	South (180°)	55.3	48.6	43.9	41.4	39.8	34.2	21.8	0.0
	East (90°)	55.2	48.6	43.9	41.5	39.9	34.3	21.9	0.0
	North (0°)	51.7	44.5	38.2	35.0	31.0	25.5	10.2	0.0
	West (270°)	51.7	43.6	40.3	37.1	32.8	24.9	7.0	0.0
91	South (180°)	52.7	44.8	41.8	38.9	35.4	27.8	11.3	0.0
	East (90°)	51.3	43.3	39.8	36.9	33.4	26.0	9.7	0.0
	North (0°)	49.7	41.4	37.1	33.5	28.3	20.3	0.0	0.0
	West (270°)	51.6	43.8	40.8	37.4	32.8	24.3	5.3	0.0
92	South (180°)	51.8	44.1	41.1	38.0	34.0	26.0	7.9	0.0
	East (90°)	50.5	42.4	38.9	35.8	31.7	23.7	5.5	0.0
	North (0°)	50.2	42.0	38.4	34.6	29.3	20.5	0.0	0.0
	West (270°)	49.8	43.3	40.2	36.5	31.3	22.1	0.1	0.0
93	South (180°)	50.2	43.1	39.8	36.5	31.8	23.1	3.0	0.0
	East (90°)	50.6	42.8	39.5	36.1	31.8	23.4	4.2	0.0
	North (0°)	50.1	42.9	39.7	35.9	31.4	21.9	0.7	0.0
	West (270°)	52.8	44.9	41.7	38.7	35.1	27.6	11.5	0.0
94	South (180°)	53.1	45.3	42.2	39.4	36.0	28.5	12.3	0.0
	East (90°)	50.7	42.6	38.6	35.4	31.2	23.5	5.3	0.0
	North (0°)	50.1	41.9	37.5	33.5	27.8	19.7	0.0	0.0
	West (270°)	53.6	46.1	42.0	39.4	37.1	30.5	15.7	0.0
95	South (180°)	53.9	46.5	42.9	40.1	37.0	29.9	14.5	0.0
	East (90°)	52.1	44.8	40.7	37.2	33.1	25.7	7.6	0.0
	North (0°)	51.9	45.2	40.7	37.7	34.9	28.4	13.9	0.0
	West (270°)	53.2	47.3	42.0	39.3	39.3	32.4	19.6	0.0
96	South (180°)	55.4	48.9	44.1	41.7	40.1	34.5	22.1	0.4
	East (90°)	54.3	47.1	42.1	39.5	36.3	29.9	15.1	0.0
	North (0°)	52.4	45.5	39.5	36.6	33.2	27.5	12.7	0.0

97	West (270°)	54.6	47.5	43.4	40.8	38.5	32.4	19.2	0.0
	South (180°)	52.0	44.3	39.3	36.0	31.5	24.7	7.7	0.0
	East (90°)	52.3	44.6	39.9	36.5	31.9	24.8	7.8	0.0
	North (0°)	54.7	47.6	43.5	40.8	38.6	32.4	19.2	0.0
98	West (270°)	56.2	49.5	44.9	42.5	40.9	35.2	22.7	0.8
	South (180°)	55.4	48.7	43.6	41.1	39.8	34.3	22.1	0.8
	East (90°)	52.6	45.4	39.2	35.6	30.4	25.0	9.6	0.0
	North (0°)	54.0	46.8	41.7	38.7	35.6	29.3	14.8	0.0
99	West (270°)	55.1	48.4	44.0	41.5	39.8	33.8	21.0	0.0
	South (180°)	52.7	45.2	40.5	37.3	32.8	25.9	9.3	0.0
	East (90°)	51.2	43.8	37.1	33.6	28.5	23.4	7.8	0.0
	North (0°)	54.4	47.7	42.8	40.5	39.2	33.5	21.0	0.0
100	West (270°)	55.9	49.5	44.5	42.2	41.0	35.5	23.1	0.6
	South (180°)	53.9	47.6	42.5	39.7	39.4	32.5	19.6	0.0
	East (90°)	51.4	44.5	36.4	32.6	27.0	24.1	9.7	0.0
	North (0°)	53.7	47.0	40.8	38.6	36.8	31.2	18.1	0.0
101	West (270°)	52.8	45.0	41.6	38.6	35.1	27.6	11.3	0.0
	South (180°)	52.2	44.4	40.6	37.6	34.4	27.1	11.2	0.0
	East (90°)	52.2	44.3	40.5	37.4	33.8	26.6	10.8	0.0
	North (0°)	52.9	45.0	41.5	38.4	34.6	27.1	11.0	0.0
102	West (270°)	52.6	45.3	39.7	36.3	31.4	25.3	9.7	0.0
	South (180°)	55.2	48.7	43.7	41.3	39.8	34.3	22.1	0.8
	East (90°)	55.5	48.8	44.1	41.6	40.0	34.4	22.1	0.8
	North (0°)	53.0	45.7	40.6	37.2	32.4	25.8	9.9	0.0
103	West (270°)	52.3	44.9	40.7	37.4	35.7	27.8	12.6	0.0
	South (180°)	53.6	46.1	42.1	39.4	36.7	30.0	15.5	0.0
	East (90°)	53.7	45.9	42.1	39.4	36.2	29.1	13.2	0.0
	North (0°)	52.8	45.1	41.2	38.1	34.9	27.7	11.9	0.0
104	West (270°)	52.6	44.9	40.3	37.4	34.2	27.7	12.5	0.0
	South (180°)	54.0	46.5	42.6	39.8	36.8	30.0	15.0	0.0
	East (90°)	54.3	47.0	43.2	40.4	37.8	30.9	16.3	0.0
	North (0°)	53.1	45.7	41.4	38.6	35.9	29.3	14.7	0.0
105	West (270°)	55.7	49.0	44.3	41.7	40.4	34.5	22.1	0.4
	South (180°)	56.0	49.2	44.7	42.2	40.4	34.6	22.1	0.4
	East (90°)	53.1	45.5	39.7	36.4	31.9	25.9	9.9	0.0
	North (0°)	52.7	45.4	39.5	36.3	32.2	26.4	10.9	0.0
106	West (270°)	48.0	39.8	36.7	32.6	26.8	16.5	0.0	0.0
	South (180°)	49.1	40.8	38.0	34.4	29.2	19.6	0.0	0.0
	East (90°)	46.9	38.5	35.1	31.6	26.6	17.6	0.0	0.0
	North (0°)	44.8	36.2	30.7	25.5	19.3	9.7	0.0	0.0

107	West (270°)	48.1	40.0	36.7	33.0	28.1	19.1	0.0	0.0
	South (180°)	50.5	42.4	39.7	36.6	32.4	24.1	5.8	0.0
	East (90°)	48.6	40.5	37.3	34.4	30.6	22.8	5.3	0.0
	North (0°)	44.3	35.7	27.9	22.9	16.0	12.0	0.0	0.0
108	West (270°)	53.8	46.2	42.4	39.7	37.0	30.3	15.7	0.0
	South (180°)	54.6	47.1	43.8	41.0	38.3	31.1	16.1	0.0
	East (90°)	51.6	43.6	39.0	36.0	32.4	25.4	8.5	0.0
	North (0°)	49.7	41.6	34.2	30.2	24.4	20.0	2.2	0.0
109	West (270°)	52.2	44.8	40.5	37.4	33.2	26.1	9.1	0.0
	South (180°)	55.0	48.0	44.1	41.5	39.2	33.0	19.7	0.0
	East (90°)	53.6	46.9	42.1	39.7	38.1	32.3	19.5	0.0
	North (0°)	49.3	42.0	32.8	28.6	22.6	21.0	5.9	0.0
110	West (270°)	56.7	50.0	45.2	42.7	41.2	35.6	23.1	0.6
	South (180°)	55.6	48.4	43.6	40.7	38.0	31.7	17.7	0.0
	East (90°)	54.7	47.4	42.3	39.3	35.7	29.2	13.7	0.0
	North (0°)	55.9	49.2	44.1	41.5	40.3	34.6	22.1	0.4
111	West (270°)	52.4	44.6	40.8	37.4	34.6	26.1	8.7	0.0
	South (180°)	54.2	46.4	43.1	40.2	36.8	29.4	13.4	0.0
	East (90°)	53.9	46.0	42.6	39.6	36.1	28.4	11.6	0.0
	North (0°)	52.3	44.2	40.4	37.2	33.0	25.2	6.4	0.0
112	West (270°)	52.9	45.0	40.8	37.3	34.1	26.0	8.5	0.0
	South (180°)	54.1	46.0	42.2	39.0	35.3	28.1	11.1	0.0
	East (90°)	55.0	47.4	43.8	41.0	38.0	31.1	16.1	0.0
	North (0°)	54.0	46.1	42.2	39.2	36.2	29.2	13.1	0.0
113	West (270°)	55.7	49.2	43.7	40.8	40.0	33.3	20.2	0.0
	South (180°)	57.0	50.2	45.2	42.6	40.6	35.0	22.5	1.1
	East (90°)	57.1	50.5	45.2	42.7	40.9	35.3	22.9	1.9
	North (0°)	56.5	50.0	44.5	41.9	40.2	34.9	22.7	1.8
114	West (270°)	54.0	46.4	41.5	38.3	34.4	27.6	11.5	0.0
	South (180°)	56.2	49.2	44.9	42.3	40.1	34.0	21.0	0.0
	East (90°)	56.2	49.2	44.9	42.2	40.2	34.0	21.0	0.0
	North (0°)	54.0	46.4	41.5	38.4	34.5	27.8	12.0	0.0
115	West (270°)	55.0	47.6	42.6	39.6	36.2	29.8	14.5	0.0
	South (180°)	55.8	48.5	43.9	41.1	38.0	31.6	17.0	0.0
	East (90°)	56.7	50.0	45.1	42.6	41.1	35.6	23.1	1.6
	North (0°)	56.0	49.4	44.1	41.6	40.4	34.8	22.5	1.5
116	West (270°)	54.4	46.9	42.8	39.9	36.5	29.4	13.5	0.0
	South (180°)	54.6	47.1	43.1	40.0	36.8	29.5	13.4	0.0
	East (90°)	54.6	47.6	42.9	40.4	38.5	32.7	19.7	0.0
	North (0°)	54.3	47.4	42.3	39.8	38.4	32.5	19.6	0.0

117	West (270°)	55.7	48.7	44.5	41.9	40.0	33.5	19.8	0.0
	South (180°)	55.7	48.4	44.2	41.5	39.1	32.8	19.2	0.0
	East (90°)	53.5	45.9	40.8	37.9	34.4	27.9	12.2	0.0
	North (0°)	53.6	46.3	41.4	38.5	36.6	29.5	14.3	0.0
118	West (270°)	56.3	49.4	44.9	42.4	40.9	34.7	21.6	0.0
	South (180°)	56.1	49.1	44.5	42.0	40.0	34.0	21.0	0.0
	East (90°)	53.6	46.1	40.5	37.5	33.8	27.6	11.8	0.0
	North (0°)	53.8	46.7	41.5	38.6	36.9	29.9	14.9	0.0
119	West (270°)	56.8	50.1	45.1	42.7	41.3	35.8	23.3	1.1
	South (180°)	56.7	49.9	45.0	42.6	40.9	35.2	22.7	0.9
	East (90°)	54.0	46.7	40.8	37.7	34.3	28.5	12.8	0.0
	North (0°)	53.9	47.2	41.5	38.4	37.4	30.3	15.8	0.0
120	West (270°)	55.5	48.4	44.5	41.7	39.1	32.6	18.7	0.0
	South (180°)	54.8	47.7	43.5	40.7	37.9	31.5	17.8	0.0
	East (90°)	52.0	46.2	41.7	38.8	35.5	28.7	12.9	0.0
	North (0°)	52.9	46.9	42.7	39.8	37.6	30.1	14.2	0.0
121	West (270°)	55.9	48.7	44.7	42.0	39.6	33.1	19.3	0.0
	South (180°)	55.4	47.9	43.6	40.7	38.2	31.8	17.9	0.0
	East (90°)	53.8	46.2	41.5	38.6	35.3	28.6	12.8	0.0
	North (0°)	54.3	46.7	42.2	39.4	36.8	29.9	14.1	0.0
122	West (270°)	55.0	47.6	43.7	41.0	38.2	31.4	16.4	0.0
	South (180°)	54.7	47.3	43.4	40.4	38.1	30.5	15.0	0.0
	East (90°)	53.8	46.3	41.8	39.1	36.4	30.0	15.6	0.0
	North (0°)	53.7	46.3	41.5	38.8	36.8	30.1	15.8	0.0
123	West (270°)	56.7	49.7	44.8	42.3	40.5	34.8	22.3	0.7
	South (180°)	57.2	50.2	45.6	43.0	41.0	35.2	22.4	0.7
	East (90°)	56.1	48.8	44.5	41.6	38.8	31.6	15.8	0.0
	North (0°)	55.7	48.3	43.7	40.8	37.9	30.9	15.1	0.0
124	West (270°)	57.1	50.3	45.7	43.2	41.5	35.7	23.1	1.4
	South (180°)	55.5	48.2	43.6	40.7	37.5	31.0	16.4	0.0
	East (90°)	54.3	46.9	41.5	38.3	34.3	28.0	12.1	0.0
	North (0°)	56.3	49.5	44.6	42.1	40.4	34.8	22.5	1.3
125	West (270°)	56.1	49.0	44.8	42.2	40.0	33.8	20.7	0.0
	South (180°)	55.1	48.0	43.8	40.9	39.5	32.2	18.3	0.0
	East (90°)	53.8	46.2	41.5	38.5	34.7	27.9	11.2	0.0
	North (0°)	54.6	47.0	42.4	39.7	36.3	29.5	13.7	0.0
126	West (270°)	56.1	48.8	44.8	42.2	39.6	33.2	19.3	0.0
	South (180°)	55.5	48.1	44.0	41.3	38.6	32.0	17.7	0.0
	East (90°)	54.0	46.5	41.9	38.9	35.7	29.0	13.7	0.0
	North (0°)	54.9	47.5	43.1	40.3	37.5	31.1	17.0	0.0

127	West (270°)	53.7	45.9	42.0	39.1	35.9	29.0	14.2	0.0
	South (180°)	54.3	47.0	43.3	40.6	38.0	31.2	16.7	0.0
	East (90°)	52.0	44.5	40.2	36.9	35.0	27.0	11.3	0.0
	North (0°)	51.2	43.2	38.3	34.3	28.6	21.3	2.5	0.0
128	West (270°)	53.7	46.5	42.1	39.5	37.2	31.0	17.5	0.0
	South (180°)	52.8	45.7	41.1	38.0	37.0	29.5	15.1	0.0
	East (90°)	53.2	45.9	41.4	38.6	35.8	29.4	15.1	0.0
	North (0°)	53.4	46.0	41.2	38.5	36.1	29.6	15.3	0.0
129	West (270°)	55.2	48.6	43.6	41.3	39.9	34.4	22.2	0.9
	South (180°)	53.3	46.1	40.3	37.4	35.5	30.0	16.2	0.0
	East (90°)	52.8	45.6	40.2	37.2	33.5	27.4	12.3	0.0
	North (0°)	54.1	46.9	42.0	39.2	37.2	31.1	17.0	0.0
130	West (270°)	53.1	45.7	41.9	39.3	36.8	30.2	16.0	0.0
	South (180°)	49.5	41.7	36.0	32.3	29.4	21.8	4.0	0.0
	East (90°)	50.6	42.8	38.3	35.0	30.7	23.4	5.6	0.0
	North (0°)	53.5	46.0	42.4	39.7	37.1	30.3	16.1	0.0
131	West (270°)	53.2	45.9	40.3	36.7	31.7	25.8	10.3	0.0
	South (180°)	52.4	45.2	37.6	34.2	29.3	25.1	10.4	0.0
	East (90°)	56.0	49.5	44.5	42.3	40.9	35.4	23.1	1.7
	North (0°)	56.2	49.7	45.0	42.5	41.2	35.3	22.8	1.7
132	West (270°)	50.5	42.2	38.3	34.9	30.0	21.9	2.0	0.0
	South (180°)	48.9	40.9	36.3	32.4	28.6	20.1	0.0	0.0
	East (90°)	51.6	43.9	40.5	37.5	34.9	27.0	10.8	0.0
	North (0°)	52.6	44.7	41.5	38.7	35.2	27.7	11.5	0.0
133	West (270°)	54.7	48.4	43.5	41.1	39.8	34.2	22.0	0.4
	South (180°)	49.9	43.4	34.5	30.3	24.6	22.8	8.8	0.0
	East (90°)	51.0	44.1	37.3	33.7	30.3	24.5	9.4	0.0
	North (0°)	55.2	48.7	44.1	41.7	40.1	34.4	22.0	0.4
134	West (270°)	54.4	47.7	43.1	40.6	39.1	33.3	20.8	0.0
	South (180°)	49.6	42.6	34.2	29.9	24.2	21.8	7.3	0.0
	East (90°)	50.7	43.5	37.1	33.7	29.1	23.7	8.1	0.0
	North (0°)	54.8	48.0	43.6	41.2	39.3	33.5	20.8	0.0
135	West (270°)	53.9	47.7	43.0	40.3	40.0	33.0	20.0	0.0
	South (180°)	50.3	43.5	34.8	30.6	25.2	23.1	9.1	0.0
	East (90°)	51.7	44.8	37.1	34.4	30.6	25.7	11.7	0.0
	North (0°)	55.3	48.7	44.0	41.6	40.1	34.6	22.3	0.9
136	West (270°)	52.6	45.3	40.0	36.9	33.3	27.1	12.0	0.0
	South (180°)	50.6	43.6	35.9	31.7	26.4	22.9	8.5	0.0
	East (90°)	54.3	47.8	42.5	40.3	39.2	33.8	21.6	0.0
	North (0°)	55.3	48.6	44.0	41.6	40.0	34.3	21.8	0.0

137	West (270°)	52.0	44.8	39.9	36.5	33.9	26.3	10.3	0.0
	South (180°)	50.3	43.0	35.9	31.8	26.7	21.9	6.3	0.0
	East (90°)	53.8	47.0	42.1	39.7	38.2	32.4	19.6	0.0
	North (0°)	54.9	47.9	43.7	41.2	39.3	33.2	20.1	0.0
138	West (270°)	51.9	44.5	40.1	36.8	34.2	26.3	10.1	0.0
	South (180°)	50.1	42.4	36.2	32.5	27.1	21.5	4.4	0.0
	East (90°)	53.1	46.0	41.4	38.9	36.9	30.8	17.4	0.0
	North (0°)	54.3	47.2	43.3	40.7	38.4	32.0	18.3	0.0
139	West (270°)	49.7	41.2	38.0	34.5	29.9	21.2	0.5	0.0
	South (180°)	47.2	38.5	33.7	30.1	24.9	16.6	0.0	0.0
	East (90°)	49.0	40.5	37.0	33.4	29.1	20.6	0.5	0.0
	North (0°)	50.7	42.7	39.9	36.4	32.1	22.9	2.7	0.0
140	West (270°)	48.2	39.9	37.0	33.8	29.5	21.0	0.7	0.0
	South (180°)	46.0	37.6	33.9	30.5	25.8	17.4	0.0	0.0
	East (90°)	46.3	37.7	33.8	30.3	25.6	16.9	0.0	0.0
	North (0°)	48.5	40.4	37.6	34.4	29.8	21.0	0.3	0.0
141	West (270°)	49.1	40.9	38.0	34.6	29.8	20.7	0.0	0.0
	South (180°)	44.2	35.3	27.6	22.2	14.7	9.6	0.0	0.0
	East (90°)	47.3	38.9	35.2	31.1	25.1	15.3	0.0	0.0
	North (0°)	50.3	42.2	39.6	36.0	30.9	21.6	0.0	0.0
142	West (270°)	50.8	43.0	40.0	37.0	33.7	25.5	8.0	0.0
	South (180°)	45.7	37.2	29.3	24.4	17.7	14.1	0.0	0.0
	East (90°)	47.9	39.5	34.8	31.1	25.5	17.5	0.0	0.0
	North (0°)	51.8	43.8	41.1	38.1	34.2	26.2	8.7	0.0
143	West (270°)	50.3	42.1	39.3	36.2	31.9	23.6	4.7	0.0
	South (180°)	45.8	36.9	29.2	25.1	19.1	13.5	0.0	0.0
	East (90°)	48.1	39.8	36.0	32.2	26.6	17.5	0.0	0.0
	North (0°)	51.1	43.2	40.5	37.0	33.0	23.8	4.1	0.0
144	West (270°)	48.0	39.6	35.9	32.1	26.5	17.1	0.0	0.0
	South (180°)	46.0	37.3	31.8	27.4	21.0	12.3	0.0	0.0
	East (90°)	49.5	41.4	38.4	34.8	30.0	20.2	0.0	0.0
	North (0°)	50.5	42.4	39.8	36.2	31.2	21.6	0.0	0.0
145	West (270°)	49.3	41.1	38.2	34.8	30.0	21.1	0.4	0.0
	South (180°)	44.7	35.8	28.2	23.1	15.9	10.5	0.0	0.0
	East (90°)	47.9	39.5	36.0	32.2	26.6	17.2	0.0	0.0
	North (0°)	50.7	42.6	40.0	36.5	31.6	22.3	1.0	0.0
146	West (270°)	50.0	41.9	39.0	35.8	31.5	23.0	3.7	0.0
	South (180°)	45.7	36.8	29.1	24.8	18.8	13.0	0.0	0.0
	East (90°)	48.3	39.9	36.3	32.6	27.2	18.1	0.0	0.0
	North (0°)	51.1	43.1	40.4	37.0	32.8	23.6	3.4	0.0

147	West (270°)	50.7	42.6	39.5	36.4	32.3	24.3	6.4	0.0
	South (180°)	47.3	38.3	31.5	27.2	22.9	16.3	0.0	0.0
	East (90°)	50.0	41.8	38.4	35.0	30.4	22.0	2.1	0.0
	North (0°)	52.0	44.0	41.1	37.9	33.9	25.6	7.3	0.0
148	West (270°)	50.0	42.1	37.8	34.2	30.7	22.2	3.0	0.0
	South (180°)	49.7	41.6	37.0	33.2	28.3	20.6	1.2	0.0
	East (90°)	52.8	45.0	41.7	38.7	35.3	28.0	12.5	0.0
	North (0°)	53.1	45.3	42.1	39.2	35.8	28.5	12.9	0.0
149	West (270°)	47.4	38.7	34.8	30.9	25.6	16.2	0.0	0.0
	South (180°)	45.5	37.1	31.8	27.1	21.7	12.0	0.0	0.0
	East (90°)	49.1	40.7	37.7	34.2	29.1	19.7	0.0	0.0
	North (0°)	50.0	41.9	39.2	35.6	30.6	21.0	0.0	0.0
150	West (270°)	47.0	38.4	34.5	30.5	25.0	15.3	0.0	0.0
	South (180°)	45.3	36.9	31.8	27.1	21.8	11.8	0.0	0.0
	East (90°)	48.9	40.5	37.5	33.8	28.6	19.0	0.0	0.0
	North (0°)	49.7	41.6	38.8	35.2	29.9	20.0	0.0	0.0
151	West (270°)	47.9	39.7	35.8	31.7	26.8	16.9	0.0	0.0
	South (180°)	46.8	38.2	33.3	29.3	23.7	15.4	0.0	0.0
	East (90°)	50.4	42.2	39.3	36.1	31.5	22.7	2.5	0.0
	North (0°)	51.0	42.9	40.2	36.8	32.1	23.2	2.8	0.0
152	West (270°)	47.7	39.0	35.1	31.3	26.2	17.0	0.0	0.0
	South (180°)	46.0	37.3	32.1	27.8	21.6	13.0	0.0	0.0
	East (90°)	49.5	41.0	38.1	34.6	29.7	20.6	0.0	0.0
	North (0°)	50.3	42.2	39.6	36.1	31.2	21.9	0.0	0.0
153	West (270°)	45.5	37.0	33.5	29.4	23.4	12.9	0.0	0.0
	South (180°)	43.0	33.7	26.8	21.4	15.7	6.7	0.0	0.0
	East (90°)	46.7	38.6	35.5	31.1	25.1	13.9	0.0	0.0
	North (0°)	48.0	39.6	36.8	32.7	26.7	15.9	0.0	0.0
154	West (270°)	45.7	37.2	33.6	29.6	23.6	13.3	0.0	0.0
	South (180°)	43.8	35.5	30.6	25.6	19.9	8.9	0.0	0.0
	East (90°)	47.0	38.9	35.8	31.6	25.7	14.7	0.0	0.0
	North (0°)	48.0	39.8	36.9	33.0	27.0	16.4	0.0	0.0
155	West (270°)	45.9	37.5	34.0	30.2	24.5	14.4	0.0	0.0
	South (180°)	43.6	35.2	30.2	25.0	18.9	8.0	0.0	0.0
	East (90°)	46.7	38.6	35.4	31.0	25.0	13.8	0.0	0.0
	North (0°)	48.0	39.8	37.0	33.0	27.1	16.6	0.0	0.0
156	West (270°)	46.9	38.5	35.3	31.4	25.7	15.6	0.0	0.0
	South (180°)	43.5	34.2	27.0	21.4	14.9	6.6	0.0	0.0
	East (90°)	46.7	38.5	35.1	30.6	24.4	13.0	0.0	0.0
	North (0°)	48.7	40.4	37.6	33.6	27.7	17.2	0.0	0.0

157	West (270°)	47.0	38.7	35.6	31.9	26.4	16.5	0.0	0.0
	South (180°)	42.4	33.4	25.6	19.8	11.8	5.7	0.0	0.0
	East (90°)	45.7	37.5	33.9	29.3	23.0	11.7	0.0	0.0
	North (0°)	48.5	40.3	37.6	33.7	27.9	17.6	0.0	0.0
158	West (270°)	45.9	37.5	33.9	30.0	24.1	14.0	0.0	0.0
	South (180°)	44.0	35.6	30.7	25.7	19.9	9.1	0.0	0.0
	East (90°)	47.2	39.1	36.0	31.9	26.1	15.3	0.0	0.0
	North (0°)	48.3	40.0	37.3	33.4	27.6	17.1	0.0	0.0
159	West (270°)	45.9	37.4	33.7	29.7	23.7	13.5	0.0	0.0
	South (180°)	44.2	35.8	31.0	26.1	20.7	10.0	0.0	0.0
	East (90°)	47.5	39.4	36.4	32.4	26.9	16.3	0.0	0.0
	North (0°)	48.4	40.2	37.4	33.6	27.8	17.4	0.0	0.0
160	West (270°)	46.4	37.8	34.0	30.0	24.1	14.1	0.0	0.0
	South (180°)	44.7	36.3	31.2	26.3	20.8	10.3	0.0	0.0
	East (90°)	48.3	40.2	37.3	33.3	27.7	17.2	0.0	0.0
	North (0°)	49.2	40.9	38.2	34.4	28.6	18.4	0.0	0.0
161	West (270°)	46.3	38.0	34.2	30.3	24.5	14.6	0.0	0.0
	South (180°)	43.7	36.4	31.3	26.4	20.8	10.5	0.0	0.0
	East (90°)	48.0	40.4	37.5	33.5	28.1	17.7	0.0	0.0
	North (0°)	49.2	41.1	38.4	34.7	29.1	19.0	0.0	0.0
162	West (270°)	45.6	37.6	34.8	30.9	25.4	15.0	0.0	0.0
	South (180°)	39.7	30.7	22.9	17.2	9.3	3.4	0.0	0.0
	East (90°)	40.0	30.9	23.3	18.3	11.1	4.0	0.0	0.0
	North (0°)	45.8	37.6	34.9	31.1	25.4	15.3	0.0	0.0
163	West (270°)	46.7	38.0	34.2	30.0	24.4	14.4	0.0	0.0
	South (180°)	44.9	36.6	31.6	26.8	21.6	11.3	0.0	0.0
	East (90°)	48.5	40.1	37.1	33.3	27.9	18.0	0.0	0.0
	North (0°)	49.4	41.1	38.4	34.7	29.1	19.0	0.0	0.0
164	West (270°)	46.4	37.7	33.8	29.5	23.7	13.4	0.0	0.0
	South (180°)	44.8	36.4	31.6	26.8	21.7	11.1	0.0	0.0
	East (90°)	48.2	39.8	36.8	32.9	27.3	17.2	0.0	0.0
	North (0°)	49.0	40.8	38.0	34.1	28.3	18.0	0.0	0.0
165	West (270°)	45.9	37.2	33.5	29.3	23.3	12.8	0.0	0.0
	South (180°)	44.1	35.8	31.2	26.3	21.2	10.3	0.0	0.0
	East (90°)	47.1	38.7	35.6	31.6	26.0	15.7	0.0	0.0
	North (0°)	48.1	39.9	37.0	33.1	27.2	16.6	0.0	0.0
166	West (270°)	55.9	49.5	43.6	41.2	39.8	34.6	22.4	1.1
	South (180°)	56.5	50.4	45.4	42.9	42.9	36.0	23.2	1.7
	East (90°)	56.7	50.1	44.9	42.4	40.7	35.2	22.8	1.4
	North (0°)	54.9	48.0	41.0	37.9	34.4	28.8	14.8	0.0

167	West (270°)	53.8	46.8	42.5	39.5	38.2	30.7	16.4	0.0
	South (180°)	55.5	48.5	44.6	41.8	39.7	32.9	19.2	0.0
	East (90°)	54.5	46.9	42.8	39.8	36.2	29.0	13.1	0.0
	North (0°)	52.7	44.9	39.7	36.4	31.5	24.6	6.9	0.0
168	West (270°)	55.8	48.5	43.9	40.9	38.0	31.4	16.5	0.0
	South (180°)	56.1	48.7	44.1	41.3	38.2	31.6	16.7	0.0
	East (90°)	57.1	50.1	45.8	43.2	40.9	34.6	20.9	0.0
	North (0°)	56.7	49.7	45.4	42.6	40.8	33.9	19.9	0.0
169	West (270°)	57.2	50.3	45.7	43.1	41.1	35.2	22.6	0.9
	South (180°)	56.8	50.2	45.5	42.8	41.9	35.3	22.3	0.0
	East (90°)	55.4	48.5	43.0	40.2	37.9	32.2	19.1	0.0
	North (0°)	55.4	48.0	42.5	39.4	35.8	29.6	14.8	0.0
170	West (270°)	56.6	49.7	45.2	42.6	40.6	34.8	22.3	0.9
	South (180°)	55.3	48.6	43.9	41.3	40.4	33.5	20.2	0.0
	East (90°)	54.5	47.1	42.1	39.3	36.1	29.7	14.6	0.0
	North (0°)	55.4	48.0	43.3	40.4	37.0	30.2	15.0	0.0
171	West (270°)	56.4	49.1	45.0	42.4	39.8	33.3	19.3	0.0
	South (180°)	55.1	47.8	43.1	40.3	37.6	31.2	17.1	0.0
	East (90°)	55.0	47.9	42.9	40.2	37.8	31.9	18.6	0.0
	North (0°)	56.3	49.2	44.8	42.1	39.9	33.7	20.2	0.0
172	West (270°)	53.9	47.6	42.3	39.7	39.7	32.9	20.1	0.0
	South (180°)	53.2	46.0	40.5	37.5	33.8	27.7	12.6	0.0
	East (90°)	54.6	47.4	42.5	39.6	36.2	29.4	14.3	0.0
	North (0°)	55.8	49.1	44.3	41.9	40.3	34.8	22.5	1.6
173	West (270°)	50.5	42.4	36.5	33.1	28.2	21.8	4.1	0.0
	South (180°)	51.9	44.4	40.1	37.3	34.5	27.7	12.8	0.0
	East (90°)	53.7	46.4	42.9	40.0	37.8	30.2	15.1	0.0
	North (0°)	53.1	45.5	41.8	38.9	35.8	28.9	14.0	0.0
174	West (270°)	56.6	49.8	44.9	42.4	40.6	35.0	22.5	0.9
	South (180°)	56.6	49.8	44.8	42.4	40.8	35.1	22.6	1.0
	East (90°)	55.9	48.8	44.1	41.3	38.4	32.1	18.1	0.0
	North (0°)	55.6	48.5	43.8	40.7	38.3	31.1	16.3	0.0
175	West (270°)	53.9	46.1	42.1	39.3	36.1	29.1	13.1	0.0
	South (180°)	54.2	46.5	42.5	39.6	36.5	29.5	13.9	0.0
	East (90°)	55.2	47.6	43.9	41.0	38.0	31.1	16.1	0.0
	North (0°)	55.0	47.4	43.6	40.8	37.8	30.8	15.7	0.0
176	West (270°)	53.3	46.0	41.1	38.2	34.3	27.4	10.3	0.0
	South (180°)	54.9	47.6	43.3	40.6	38.1	31.5	17.5	0.0
	East (90°)	55.8	48.7	44.9	42.0	39.8	32.7	18.5	0.0
	North (0°)	54.8	47.7	43.8	40.8	37.5	30.7	15.9	0.0

177	West (270°)	55.4	47.9	43.8	41.0	38.2	31.5	17.0	0.0
	South (180°)	55.8	48.5	44.3	41.8	39.3	32.9	18.9	0.0
	East (90°)	55.6	48.0	44.0	41.2	38.2	31.4	16.5	0.0
	North (0°)	55.1	47.4	43.6	40.4	36.7	29.3	12.5	0.0
178	West (270°)	50.7	43.9	35.8	32.1	27.6	23.9	9.4	0.0
	South (180°)	52.5	47.0	41.6	39.0	39.4	32.6	19.9	0.0
	East (90°)	54.6	48.6	43.6	41.2	39.8	34.4	22.3	1.2
	North (0°)	52.7	46.0	40.5	37.4	33.2	27.1	12.4	0.0
179	West (270°)	48.3	40.7	33.1	28.8	23.1	19.2	3.3	0.0
	South (180°)	49.2	41.7	34.5	31.2	27.2	21.5	6.2	0.0
	East (90°)	53.2	46.1	42.2	39.4	37.2	30.8	17.4	0.0
	North (0°)	52.3	45.3	41.4	38.4	37.1	29.3	15.1	0.0
180	West (270°)	57.5	51.2	45.8	43.5	42.5	37.2	25.2	4.0
	South (180°)	56.3	49.7	44.0	41.6	40.2	34.8	22.5	1.0
	East (90°)	55.7	48.7	43.3	40.4	37.0	30.8	15.8	0.0
	North (0°)	57.1	50.4	45.3	42.7	40.9	35.3	22.8	1.5
181	West (270°)	55.7	48.2	42.5	39.2	34.7	28.7	13.0	0.0
	South (180°)	56.8	49.9	44.6	41.9	39.9	34.3	21.7	0.0
	East (90°)	58.3	51.6	46.7	44.3	43.0	37.4	25.0	3.4
	North (0°)	57.6	50.7	45.9	43.2	41.3	35.5	22.9	1.7
182	West (270°)	56.7	49.7	44.9	42.2	39.7	33.5	19.5	0.0
	South (180°)	56.3	49.3	44.3	41.6	39.2	33.1	19.3	0.0
	East (90°)	56.7	49.9	44.6	42.0	40.5	35.1	22.7	1.7
	North (0°)	57.2	50.5	45.6	43.1	41.3	35.7	23.2	1.8
183	West (270°)	55.2	47.8	43.3	40.3	36.8	30.2	15.0	0.0
	South (180°)	55.2	48.7	43.9	41.3	40.6	33.6	20.4	0.0
	East (90°)	55.7	49.1	44.0	41.6	40.3	34.7	22.4	1.1
	North (0°)	55.1	47.8	42.8	39.9	36.4	30.0	15.4	0.0
184	West (270°)	54.7	47.2	43.3	40.4	37.5	30.8	16.5	0.0
	South (180°)	52.9	45.3	40.4	37.2	35.6	28.5	12.7	0.0
	East (90°)	53.6	46.2	41.7	39.1	36.5	30.0	15.1	0.0
	North (0°)	54.7	46.9	43.0	40.1	37.1	30.2	14.5	0.0
185	West (270°)	54.7	47.3	43.3	40.4	37.0	30.1	14.7	0.0
	South (180°)	54.1	46.8	42.3	39.6	36.9	30.4	15.7	0.0
	East (90°)	54.5	47.4	42.8	40.3	38.4	32.2	18.7	0.0
	North (0°)	55.1	47.8	43.7	40.9	38.5	32.0	18.2	0.0
186	West (270°)	45.1	36.9	34.1	30.4	25.0	15.2	0.0	0.0
	South (180°)	40.6	31.3	23.7	19.4	13.2	5.7	0.0	0.0
	East (90°)	41.8	33.7	29.3	24.1	18.0	6.8	0.0	0.0
	North (0°)	45.5	37.6	34.8	30.7	25.7	14.7	0.0	0.0

187	West (270°)	45.0	36.9	28.6	24.2	18.0	14.9	0.0	0.0
	South (180°)	45.1	36.9	28.6	24.4	18.3	15.0	0.0	0.0
	East (90°)	50.8	43.2	40.0	37.2	34.1	26.9	11.7	0.0
	North (0°)	50.7	43.2	40.0	37.1	34.1	26.9	11.7	0.0
188	West (270°)	53.8	46.9	41.5	38.9	36.3	30.4	16.5	0.0
	South (180°)	50.9	44.2	34.3	30.3	24.6	23.9	10.0	0.0
	East (90°)	55.0	48.6	43.2	40.9	39.7	34.5	22.5	1.6
	North (0°)	56.4	49.8	45.1	42.8	41.2	35.6	23.2	1.7
189	West (270°)	43.0	33.9	26.2	22.3	16.7	10.3	0.0	0.0
	South (180°)	42.4	33.5	25.8	20.8	13.8	8.4	0.0	0.0
	East (90°)	47.9	39.9	37.2	33.5	29.3	19.4	0.0	0.0
	North (0°)	48.2	40.2	37.5	34.1	29.3	20.2	0.0	0.0
190	West (270°)	41.8	32.9	25.2	19.8	12.4	7.4	0.0	0.0
	South (180°)	41.9	33.0	25.3	20.2	13.0	7.6	0.0	0.0
	East (90°)	47.9	39.7	37.1	33.6	28.6	19.4	0.0	0.0
	North (0°)	47.8	39.7	37.1	33.5	28.6	19.4	0.0	0.0
191	West (270°)	44.9	35.6	29.8	25.8	22.9	15.6	0.0	0.0
	South (180°)	43.3	34.5	26.8	22.2	15.4	10.3	0.0	0.0
	East (90°)	48.5	40.0	37.1	33.6	29.1	20.2	0.0	0.0
	North (0°)	49.1	41.1	38.5	35.2	30.8	21.9	1.9	0.0
192	West (270°)	39.3	31.8	24.1	18.8	11.4	6.4	0.0	0.0
	South (180°)	39.3	31.8	24.1	18.8	11.4	6.4	0.0	0.0
	East (90°)	45.4	38.7	36.1	32.6	27.6	18.4	0.0	0.0
	North (0°)	45.4	38.7	36.1	32.6	27.6	18.4	0.0	0.0
193	West (270°)	40.5	31.6	23.9	18.5	11.1	6.0	0.0	0.0
	South (180°)	40.5	31.6	23.9	18.5	11.1	6.0	0.0	0.0
	East (90°)	46.6	38.5	35.9	32.3	27.3	17.9	0.0	0.0
	North (0°)	46.6	38.5	35.9	32.3	27.3	17.9	0.0	0.0
194	West (270°)	40.2	31.3	23.6	18.1	10.6	5.3	0.0	0.0
	South (180°)	40.2	31.3	23.6	18.1	10.6	5.3	0.0	0.0
	East (90°)	46.4	38.2	35.6	32.0	26.8	17.3	0.0	0.0
	North (0°)	46.4	38.2	35.6	32.0	26.8	17.3	0.0	0.0
195	West (270°)	48.5	40.3	35.2	31.9	27.3	20.2	0.8	0.0
	South (180°)	46.7	38.5	30.3	25.7	19.3	16.4	0.0	0.0
	East (90°)	52.1	44.5	41.3	38.4	35.4	28.1	12.4	0.0
	North (0°)	52.8	45.0	42.0	39.2	35.9	28.5	12.6	0.0
196	West (270°)	47.7	39.3	34.7	31.4	26.8	19.0	0.0	0.0
	South (180°)	45.6	37.1	29.2	24.4	17.7	14.0	0.0	0.0
	East (90°)	51.0	43.1	40.1	37.0	33.4	25.4	8.1	0.0
	North (0°)	51.7	43.7	41.0	38.0	34.1	26.1	8.5	0.0

197	West (270°)	51.1	43.0	39.9	36.5	32.2	23.9	5.5	0.0
	South (180°)	47.7	39.5	34.1	30.0	25.9	17.6	0.0	0.0
	East (90°)	50.2	42.1	38.5	35.6	32.0	24.5	7.2	0.0
	North (0°)	52.3	44.3	41.5	38.4	34.6	26.6	9.2	0.0
198	West (270°)	52.3	44.5	41.2	38.0	34.3	26.6	10.3	0.0
	South (180°)	48.6	40.5	34.8	30.7	26.8	19.1	0.0	0.0
	East (90°)	50.9	42.9	39.0	36.2	32.7	25.3	8.3	0.0
	North (0°)	53.4	45.6	42.5	39.6	36.1	28.5	12.2	0.0
199	West (270°)	51.0	43.0	40.0	36.6	32.4	24.0	5.5	0.0
	South (180°)	47.1	38.1	31.4	27.1	22.9	16.4	0.0	0.0
	East (90°)	49.3	41.1	37.4	34.3	30.1	22.1	3.0	0.0
	North (0°)	52.0	43.9	41.0	37.8	33.8	25.5	6.9	0.0
200	West (270°)	54.9	48.5	43.4	41.0	39.7	34.3	22.3	1.3
	South (180°)	50.1	43.3	33.3	29.3	23.5	22.9	9.2	0.0
	East (90°)	51.4	44.4	37.8	33.9	29.6	24.1	9.4	0.0
	North (0°)	55.5	48.8	44.2	41.6	40.0	34.5	22.3	1.3
201	West (270°)	49.5	41.5	37.5	34.2	29.6	21.9	3.4	0.0
	South (180°)	46.4	38.4	29.9	25.3	19.0	16.5	0.0	0.0
	East (90°)	51.0	43.6	39.7	37.0	34.5	27.9	13.5	0.0
	North (0°)	52.3	44.8	41.5	38.7	35.6	28.6	13.8	0.0
202	West (270°)	50.1	42.3	39.1	36.0	32.6	25.0	8.7	0.0
	South (180°)	44.5	36.4	28.3	23.4	16.6	13.2	0.0	0.0
	East (90°)	45.7	37.9	32.5	28.2	22.3	15.5	0.0	0.0
	North (0°)	50.6	43.0	40.1	37.0	33.1	25.3	8.8	0.0
203	West (270°)	51.0	43.4	40.3	37.4	34.5	26.7	10.3	0.0
	South (180°)	50.2	42.6	39.3	36.4	34.0	25.8	8.9	0.0
	East (90°)	45.9	37.4	29.3	25.6	20.2	15.9	0.0	0.0
	North (0°)	47.3	39.2	33.9	30.3	26.7	18.8	0.0	0.0
204	West (270°)	52.2	44.8	41.1	38.5	36.0	29.4	15.1	0.0
	South (180°)	52.1	44.7	40.9	38.3	35.7	29.2	15.0	0.0
	East (90°)	48.0	40.4	34.8	31.0	27.7	20.2	2.1	0.0
	North (0°)	48.2	40.7	35.4	31.8	29.1	21.3	3.4	0.0
205	West (270°)	49.7	41.7	39.0	36.0	31.9	23.6	4.8	0.0
	South (180°)	48.7	40.8	37.9	34.6	31.3	22.5	3.4	0.0
	East (90°)	43.6	35.0	27.2	22.3	15.5	11.5	0.0	0.0
	North (0°)	45.7	37.4	32.5	28.6	24.3	15.4	0.0	0.0
206	West (270°)	53.7	46.3	42.5	39.4	36.6	28.8	12.6	0.0
	South (180°)	54.2	47.0	42.7	40.1	37.9	31.7	18.2	0.0
	East (90°)	53.0	46.0	40.7	38.4	36.7	30.9	17.8	0.0
	North (0°)	52.7	45.3	40.8	37.8	34.7	28.0	12.8	0.0

207	West (270°)	54.1	45.8	42.3	39.1	35.4	27.8	9.9	0.0
	South (180°)	53.9	46.1	42.4	39.4	36.1	28.7	12.8	0.0
	East (90°)	53.2	45.0	40.8	38.0	35.3	28.5	12.2	0.0
	North (0°)	53.5	45.7	42.0	39.0	36.0	28.4	12.0	0.0
208	West (270°)	54.1	46.9	42.2	39.3	35.9	29.5	14.6	0.0
	South (180°)	55.0	48.5	43.3	40.9	39.7	34.4	22.2	1.1
	East (90°)	54.3	48.1	42.2	40.1	39.3	34.2	22.2	1.1
	North (0°)	53.2	46.2	40.9	37.9	34.9	28.9	14.4	0.0
209	West (270°)	52.8	46.3	42.0	39.2	38.4	31.1	17.6	0.0
	South (180°)	49.8	42.4	35.7	31.8	26.8	21.9	6.4	0.0
	East (90°)	49.5	42.4	32.9	30.3	26.5	22.9	8.9	0.0
	North (0°)	53.4	46.7	41.8	39.5	38.1	32.4	19.9	0.0
210	West (270°)	49.5	41.5	38.9	35.4	31.2	21.7	0.4	0.0
	South (180°)	47.4	39.0	35.6	32.1	27.1	18.1	0.0	0.0
	East (90°)	44.3	35.3	27.7	23.6	17.8	11.8	0.0	0.0
	North (0°)	48.1	39.8	36.7	33.5	29.1	20.6	0.8	0.0
211	West (270°)	50.9	43.7	40.6	37.3	34.5	25.8	9.0	0.0
	South (180°)	47.9	40.3	35.9	31.9	26.4	18.1	0.0	0.0
	East (90°)	46.4	38.2	30.0	26.7	21.9	17.0	0.0	0.0
	North (0°)	50.5	43.2	39.8	36.8	33.9	26.5	11.1	0.0
212	West (270°)	51.1	43.3	40.3	37.4	33.9	26.4	10.6	0.0
	South (180°)	47.4	39.2	34.6	30.8	25.2	17.2	0.0	0.0
	East (90°)	45.0	36.8	28.6	23.8	17.3	14.3	0.0	0.0
	North (0°)	50.1	42.5	39.2	36.3	33.4	26.0	10.5	0.0
213	West (270°)	53.4	45.9	42.5	39.8	37.0	30.1	15.5	0.0
	South (180°)	52.6	45.2	41.3	38.9	36.4	29.8	15.4	0.0
	East (90°)	48.3	40.5	33.9	29.6	24.7	18.9	1.0	0.0
	North (0°)	50.3	42.5	38.2	34.5	29.7	21.8	2.7	0.0
214	West (270°)	52.5	44.8	41.6	38.8	35.6	28.3	12.5	0.0
	South (180°)	51.0	43.5	40.0	37.0	35.0	27.1	10.9	0.0
	East (90°)	47.5	39.4	33.3	28.9	23.9	17.2	0.0	0.0
	North (0°)	49.9	41.8	37.5	33.9	28.9	20.7	1.1	0.0
215	West (270°)	48.6	40.6	37.9	34.6	30.0	21.1	0.8	0.0
	South (180°)	46.3	37.9	34.4	31.4	27.1	18.9	0.0	0.0
	East (90°)	42.8	33.9	26.2	21.4	14.5	9.3	0.0	0.0
	North (0°)	46.7	38.7	35.6	31.6	27.3	17.1	0.0	0.0

Appendix E

**Qualifications of ARCADIS Noise
Professionals**

Education

B.A. Applied Physics with
Emphasis on Theoretical
Acoustics, University of
California, San Diego

Years of Experience

Total - 23
With ARCADIS - 3

Professional Registrations

County of San Diego CEQA
Approved Noise Consultant

Professional Qualifications

Member, Acoustical Society of
America
Member, Institute of Noise
Control Engineering

Michael Burrill, INCE

Director, Project Environmental Scientist



Mr. Burrill is a Certified Noise Professional with 23 years of varied acoustical consulting experience. Specializing in Environmental Land Use Noise Compatibility, and the noise control issues that surround environmental compliance and land use permit applications, Mr. Burrill's project experience includes wind farms, construction sites, airports, roadways, railways, hotels, libraries, condominiums, schools and universities, residential subdivisions, pump stations, manufacturing facilities, entertainment venues, and the protection of sensitive avian habitats. He has obtained a well rounded and substantial background in practical construction and mechanical applications, theoretical computer programming and modeling, and related acoustical field

applications. His technical responsibilities include field investigation work, sound and noise level measurements, real time computer modeling, mathematical data analysis revealing relative acoustical trends, and project management. He is also actively involved in acoustical forensic applications to determine the source of acoustical inadequacy in existing buildings and to develop feasible solutions. He routinely assists clients with meeting their various governing municipal noise code requirements. Overall capabilities include:

- Wind turbine / wind farm land use compatibility noise impact assessments and pre-construction noise monitoring
- Building design analysis and recommendations for residential, commercial, and industrial projects
- Road and rail traffic noise impact studies, noise modeling, measurements and analysis
- Construction noise and/or vibration control plans and monitoring
- Theoretical STC and IIC construction performance modeling and evaluations
- Field FSTC and FIIC testing, room reverberation testing with acoustical applications
- Airport noise contour compatibility analysis
- Outdoor noise monitoring and site investigation and recommendations
- Field noise attenuation measurements and analysis; barrier calculations and recommendations

- Mechanical equipment noise evaluation, design, and mitigation
- Interior plumbing design analysis and potential plumbing noise impact solutions
- Title 24 exterior-to-interior noise reduction analysis for building permit compliance
- Interior noise control design for commercial and industrial facilities and private residences
- OSHA compliance noise dosimeter monitoring and hearing loss prevention plans
- Noise control blanket evaluation and analysis for construction activities and special events

Project Experience

Environmental Noise Control

Pre-Installation Ambient Noise Monitoring for the Allegheny Ridge Windfarm Portage Township, Pennsylvania

To assess future noise impacts resulting from the proposed installation of 20 large wind turbines, Mr. Burrill conducted pre-installation noise monitoring to establish baseline ambient community noise levels for post-installation regulatory code comparison. Work included collection of field noise measurements and weather telemetry data in 10-minute increments to document pre-installation noise frequency and weather conditions in the area, including wind speed, wind direction, humidity, and temperature. Purpose of the project was to accurately document community noise levels as they exist today to allow for future code assessment of the type and degree of noise impacts contributed by the windfarm once the wind turbines are operational.

Land Use Compatibility Wind Farm Noise Impact Analysis Wyoming

The project is one of the first wind farms being constructed in the state of Wyoming. It will provide alternative energy for residents located in the region where the acoustical analysis was conducted to comply with the County Wind Energy System Regulations. The acoustical analysis evaluated wind turbine noise impacts to all adjacent property lines for comparison to specific land use noise compliance standards. A robust noise assessment computer model was created using CADNA in order to calculate and determine worst-case wind turbine noise propagation impacts at adjacent property lines. Considering several different meteorological conditions, the calculations took into account the effects of temperature, humidity, wind speed, wind direction, ground absorption and associated reflection/diffraction of site topographic features.

Construction Noise Monitoring, Marine Corps Air Station Miramar California

Conducted on-site equipment noise measurements to determine the worst-case property line noise impacts for a newly proposed concrete and rock crushing/recycling plant in an area surrounded by residential neighborhoods. Analysis was used by the City of San Marcos to determine if future acoustical studies would be needed to reduce property line noise impacts.

Construction Noise & Vibration Monitoring Lankershim Bridge Widening Project Los Angeles, California

The purpose of the Lankershim Bridge widening project was to improve access to a new subway station located within the City of Los Angeles. Performed acoustical analysis of construction equipment noise and vibration impacting the surrounding communities. Designed a noise and vibration control plan and sound barrier mitigation in compliance with the Metropolitan Transportation Authority (MTA) and City of Los Angeles noise regulations to attenuate construction noise impacts to the surrounding residential communities. The noise and vibration control plan consisted of limiting the hours of activity for louder construction equipment to daytime operations, as well as limiting the use of multiple pieces of equipment. Noise and vibration monitoring was conducted throughout the duration of the project to verify that the construction activity was in compliance with the noise regulations. The project progressed through construction with zero complaints from the surrounding community.

Railway Construction Noise Monitoring for Sensitive Avian Habitat
Oceanside, California

The Sprinter Line project consisted of the construction of a new commuter railway system running from Oceanside to Escondido. Assisted with the development of a noise control plan in compliance with State of California Department of Fish & Game noise regulations for protected avian habitats. Performed acoustical analysis of commuter railway construction equipment noise impacting nesting areas of endangered birds. Designed noise control plan and sound barrier mitigation to move along the railroad tracks during phased construction operations. The project progressed through construction without any noise violations or environmental effects to the protected habitats.

Pump Station Mechanical Noise Emission Analysis
San Diego, California

Expansion of the Point Loma Municipal Waste Water District large-scale sewage treatment facility included the installation of two enormous diesel engines working in parallel and contained within a single, two-story corrugated metal building. To assess the validity of noise complaints to the surrounding residential neighborhoods, assisted with evaluating and measuring the operational equipment noise emission at the exhaust stacks and within the building structure. Performed an acoustical analysis which included data evaluation and design of appropriate noise mitigation measures to reduce site-generated mechanical noise impacts to below the maximum allowable sound level required by the City. All significant noise sources were included within the analysis to determine the worst-case noise impacts to the project site and its surrounding property lines. The analysis required a series of exterior and interior site noise measurements both at the project site and at a distance within the residential communities. Mitigation recommendations included construction material improvement to the corrugated metal building structure, along with the correct size and placement of exhaust in-line silencers.

Mechanical Noise and Vibration Analysis
Oxnard, California

The proposed expansion of a large ready-mix concrete manufacturing facility involved the installation of a concrete crusher system and the construction of a single 20,000-square foot concrete tilt-up shop building. Assisted the client with the operational equipment noise evaluation

and analysis required to comply with the City of Oxnard Noise Ordinance. Performed an acoustical analysis for the proposed expansion, including the evaluation and design of appropriate noise mitigation measures to reduce site-generated mechanical noise and vibration impacts to below the maximum allowable sound level required by the City. Interior noise levels were calculated using sound insulation properties of the exterior walls, windows and doors.

Architectural Acoustics**Acoustical Analysis for Terminal 2 Expansion**

San Diego International Airport
Lindbergh Field, California

The Terminal 2 East expansion project involved additions and modifications to provide facilities for the U.S. Immigration and Naturalization Service (INS), U.S. Customs, and Federal, State, and local Agricultural Inspection and Control for arriving passengers from foreign countries.

Evaluated and designed the projected interior acoustical environment for the terminal. To optimize speech intelligibility through the sound system and create an overall quieter environment for passengers, designed the location and selected the type of absorption material needed to reduce the acoustical energy within the terminal.

Architectural Acoustical Analysis for Athletic Area and Library

San Diego, California

The Nobel Athletic Area and Library project consists of improvements to an existing park and athletic area with the new construction of additional recreational areas, including a children's playground, a large public library, and a multi-purpose gymnasium/recreation center. Assisted with the acoustical analysis required to comply with the City of San Diego and State of California's Building Code Regulations. Evaluated roadways and aircraft noise impacting the proposed project site and building facades. Identified and evaluated all significant future environmental noise sources to determine worst-case noise impacts to the project building facades. Evaluated freeway and aircraft overflight noise impacts and calculated the interior noise levels using sound insulation properties of the exterior walls, roof, windows, and doors. Provided recommendations to exterior wall and window configurations to comply with city and state building codes. Also evaluated and designed interior acoustical environment for the large public library. Designed the location and type of absorption material needed to reduce the acoustical energy within the library to optimize speech intelligibility.

Architectural Acoustics Analysis

Hilton Garden Inn
Yuma, Arizona

Project involved the construction of a single 4-story, 150-room hotel plus outdoor recreational pool area. Performed acoustical analysis required to comply with the City of Yuma and State of Arizona Noise Code Regulations. Evaluated noise impacting the project site from roadways, railway and mechanical equipment from a nearby water treatment plant, as well as all significant future environmental noise sources to determine worst-case noise impacts to the project site and hotel building facades.

Acoustical Interior Design and Architectural Acoustical Analysis at San Diego State

University College or Arts & Letters
San Diego, California

Project consists of the new construction of a six-story tower building, a three-story west wing building, and a two-story east wing building. Evaluated nearby freeway, local roadway, and rooftop mechanical equipment noise impacting the proposed building facades, as well as all significant future environmental noise sources. The analysis included the combined noise impacts and calculated the interior noise levels for classrooms, offices, and lecture halls using sound insulation properties of the exterior walls, roof, windows, and doors. Made recommendations to exterior wall and window configurations to provide an interior noise environment that complies with city and state building codes. Also evaluated interior mechanical equipment room wall and floor/ceiling assemblies for reducing mechanical noise transmitting into adjacent offices or lecture halls in compliance with the State of California's School and Educational Facilities Program. Also addressed HVAC system design issues and made design recommendations to attenuate mechanical noise propagating through the duct work and transmitting into adjacent rooms. Designed location and type of absorption material needed to reduce acoustical energy within the lecture rooms and auditorium.

Other Representative Experience

- Environmental one-third-octave-band noise analysis for mechanical equipment for public utilities, including pump stations, generators, chillers, air conditioner systems, fans, compressors, sound enclosures for SDG&E, AT&T, MWD, Cingular, Nextel, Verizon, Sprint.
- Environmental noise analysis for several proposed power plants by PG&E Dispersed Generating Systems.
- Noise control planning, Noise Conservation Plans, and/or noise monitoring for public and commercial construction projects including: bridge widening for MTA subway system in Los Angeles, power plants, water pipeline projects near wildlife habitats, and industrial manufacturing operations.
- Environmental noise analysis and exterior-to-interior sound attenuation analysis for permit compliance with CCR Title 24 for proposed hotels, motels and commercial mixed-use developments throughout California: Hawthorn Suites, Hilton Garden Inn, Hampton Inn, AmeriSuites, Marriott, Extended Stay America, Best Western.
- Noise impact contour analysis and exterior-to-interior sound attenuation barrier calculations for compliance with CCR for building permits for numerous proposed residential and commercial projects throughout California.
- Residential sound monitoring of Hollywood Bowl concerts, County of Los Angeles.
- Noise monitoring for proposed new location of Mission Bay Amphitheatre, San Diego.
- Environmental noise and exterior-to-interior analysis for several Marriott Brighton Gardens Assisted Living Centers, A-Advantage Home Care, Inc. and Casa de las Campanas Senior Citizens Residential Care, San Diego.
- Environmental noise analysis for student housing project, University of California, San Diego and for Cal Poly, San Luis Obispo.
- Land Use Compatibility and Sensitivity Study for U.S. Naval Air Station, Miramar.
- Field and Theoretical Sound Transmission Class (STC) and Impact Insulation Class (IIC) noise analyses and testing for numerous apartment-to-condominium conversions throughout the State of California, including Premier Coastal Development, Pacifica Companies, Fairfield Residential, and Renaissance La Jolla Condominiums.
- Noise and mitigation analysis for Shell Oil Company Carwash and other carwash/minimart facilities.
- Property line noise compliances, interior noise analysis and reverberation time absorption calculations for the San Diego State University, Mission Hills High School, Redlands High

School, Burbank Elementary School and Ibarra Elementary School.

- Plumbing, mechanical, field and theoretical floor/ceiling and common wall acoustical performance certifications for restaurants, nightclubs, and commercial buildings with stacked residential units, including Maloney's, Trophy's, and Hilo Hattie's in San Diego, The Bistro in La Mesa, and The Britannia Arms in San Jose.

Education

B.A. Audio and Acoustics,
Columbia College Chicago
2005

Years of Experience

Total - 7
With ARCADIS - 3

Professional Qualifications

Member of Acoustical Society
of America
Member of Institute of Noise
Control Engineering

Professional Registrations

Approved CEQA Noise
Consultant for County of San
Diego

Kevin Fowler, INCE

Staff Acoustical Scientist



Mr. Fowler is a Certified Noise Professional with seven years of acoustical consulting experience, and specific expertise in architectural and environmental acoustics. His passion for the field of acoustics is evident in his experience to date: he was owner, producer and recording engineer of his own recording studio for six years, and was co-owner of an acoustics consulting practice for a year. He has mentored under the director of ARCADIS's Environmental Noise Control and Architectural Acoustics (ENCAA) practice, Mr. Michael Burrill, since July of 2006, further honing his unique skills in the areas of field measurements; acoustical analysis; reporting; traffic, aircraft, and railway noise studies; mechanical and construction noise and vibration impact studies; wind turbine /

wind farm noise impact studies; window, wall, and floor/ceiling assembly design evaluations (STC/IIC); and architectural interior room performance design and recommendation evaluations. He also has experience with commercial and residential noise control and sound system design solutions. His technical responsibilities include field investigation work, sound and noise level measurements, data analysis, computer modeling, and conducting and managing Sound Transmission Class (STC) and Impact Isolation Class (IIC) testing for documenting building code compliance. Projects have included residential mixed-use developments, hotels, casinos, office buildings, military installations, industrial facilities, alternative energy developments (wind farms), commercial/retail centers, hospitals and schools. He is a member of the Institute of Noise Control Engineering (INCE) and recently spoke at the Acoustical Society of America conference on the design and quality of reverberation chambers for use in teaching environments.

Project Experience**Environmental Noise Control****Land Use Compatibility Wind Farm Noise Impact Analysis**

Wyoming

The project is one of the first wind farms being constructed in the state of Wyoming. It will provide alternative energy for residents located in the region where the acoustical analysis was conducted to comply with the County Wind Energy System Regulations. The acoustical analysis evaluated wind turbine noise impacts to all adjacent property lines for comparison to specific land use noise compliance standards. A robust noise assessment computer model was created

using CADNA in order to calculate and determine worst-case wind turbine noise propagation impacts at adjacent property lines. Considering several different meteorological conditions, the calculations took into account the effects of temperature, humidity, wind speed, wind direction, ground absorption and associated reflection/diffraction of site topographic features.

Construction Noise Analysis, San Diego Gas & Electric (SDG&E) Sunrise Powerlink Project

San Diego County, California

Conducted a theoretical noise analysis associated with blasting operations in connection with a 150-mile electrical transmission line from Imperial Valley to coastal San Diego designed to maintain power reliability, reduce energy costs, and accommodate the delivery of renewable energy. Conducted noise calculations for a single worst-case blasting operation and subsequently developed a robust model to evaluate resulting worst-case noise impacts to the surrounding areas based on a continuous 12-hour time period. The noise calculations will help determine how many blasts can occur during a single day of construction in order to maintain compliance with county noise regulations.

Construction Noise Analysis, San Bernardino Water Transmission Main Project California

The project consists of the replacement of 14,700 feet of critical water main sections within three separate jurisdictions: City of Grand Terrace, County of Riverside, and City of Riverside. Directed the theoretical noise impact analysis of construction operations and designed a noise control plan in compliance with all three jurisdictions. Project work involved performing an acoustical analysis for assessment of construction equipment noise impacting the surrounding communities, and developing a robust model to evaluate worst-case noise impacts of all proposed construction operations to the surrounding commercial and residential areas. Designed noise control plan and sound barrier mitigation measures to attenuate construction noise impacts to the surrounding residential and commercial communities.

Roadway Noise Analysis, Melrose Drive Extension Projects

Oceanside, California

Conducted a roadway noise analysis to help determine the best fit roadway alignment from three proposed alternatives for the planned extension of the roadway through a residential area and County park. Developed robust model to evaluate worst-case noise impacts for each roadway alignment to the surrounding residential and county park areas, and designed a traffic sound attenuation barrier for each alignment to reduce the roadway impacts to the surrounding areas.

Land Use Compatibility Acoustical Analysis for Three Two-Story Duplexes

Del Mar, California

The project consists of the development of three separate lots each containing a single multi-family two-story duplex building with attached garages. Evaluated roadway and railway noise impacting the project site; noise impacts to common outdoor use areas; and the typical interior common wall assembly for reducing sound between adjacent residential units. Determined

necessary noise mitigation measures required for compliance within the City of Del Mar's Noise Code Regulations.

Land Use Compatibility Acoustical Analysis for Imperial Square Project

San Diego, California

Contracted by the project architect to assist with the acoustical analysis required to comply with the City of San Diego's noise element. Evaluated noise impacts from roadways, the San Diego Trolley, and aircraft, as well as all significant future noise sources to determine the worst-case noise impacts to the project site. Project consists of the new development of five city blocks containing three residential/commercial high-rise buildings over subterranean parking levels, including a market, café, retail shops, several interior courtyards, and an urban park.

Architectural Acoustics**Architectural Acoustics Analysis, Kelvin and Jamboree Condominium Project**

Irvine, California

The project consists of the new construction of four 5-story residential buildings comprising a total of 248 condominiums, a parking structure, retail/commercial space, and recreational facilities. Performed acoustical analysis to evaluate a nearby freeway, local roadways, and aircraft over flight worst-case noise impacts to the proposed common outdoor use areas and to determine noise mitigation measures necessary to comply with the City of Irvine's Noise Code Regulations. Also evaluated worst-case noise impacts to the building facades to determine the interior acoustical quality of units. Evaluated interior common wall, floor/ceiling, and corridor wall assemblies; addressed plumbing noise design issues; and evaluated proposed mechanical equipment for noise impacts to the residents below.

Construction Review and Design Analyses for 86-Unit Condominium Project

San Diego, California

The project contains 12 single-level unit and 74 townhouses in separate 3- and 4-story buildings with two levels of basement parking. Evaluated the construction design elements of the common wall, back-to-back laundry supply boxes, and plumbing isolation; conducted an evaluation of the proposed railway sound attenuation barrier; evaluated the exterior wall-mounted HVAC units to determine any transmission of railway noise through the units; evaluated the exterior wall and window configuration facing the railway to determine the need for any design enhancements to reduce low-frequency railway noise within the units; and evaluated noise emission data from exterior ground-mounted A/C units for impacts to adjacent residential units.

Sound Transmission Field Testing, Cal Poly State University Dormitory

San Luis Obispo, California

Performed acoustical field testing and analysis of the common walls, floor/ceilings, and corridor wall assemblies in connection with the new construction of a five-story dormitory style building located on the college campus. Purpose of the field testing was to determine if the structure met State building code compliance.

Architectural Acoustical Analysis, The Montage at MacArthur Place

Santa Ana, California

Conducted an acoustical analysis of one 5-story and two 6-story buildings with 276 residential condominiums, town homes, and ground-floor live/work loft space units. The analysis was performed to determine compliance with City and State Building Code regulations. The project included outdoor recreational areas, a theater, and one level each of underground and aboveground parking. The analysis evaluated a nearby freeway, local roadways, and aircraft for worst-case noise impacts to the proposed building facades to determine the exterior and interior acoustical environment. Evaluated the interior common wall, floor/ceiling, corridor wall, mechanical shaft wall, and elevator shaft wall assemblies for reducing sound transmission to residential units. Also evaluated plumbing noise design issues with respect to noise impacts resulting from water pipes traveling between multi-stacked units.

Performance Space Acoustics**Acoustical Interior Design, House of Prayer Lutheran Church**

Escondido, California

The project involves the redesign of the church's sanctuary area to provide an optimum and desirable environment for use of a pipe organ and worship. Work included design of the location and type of absorption material needed to reduce the acoustical energy within the sanctuary area. Evaluated room volume, type of surface materials within the room, and all possible noise sources to maximize the room's ability to provide a high quality worship environment.

Acoustical Interior Design, San Diego Gas & Electric Grid Control Room,

San Diego, California

Retained by the project's architect to assist with a large-scale acoustical interior re-design and remodel of SDG&E's main energy control room. The control room is used for managing power distribution throughout the County of San Diego and requires that operators communicate effectively with high speech intelligibility. Major design elements considered were the acoustical properties associated with the new and very large parabolic control panel. Evaluated and designed the location and type of absorption material needed to reduce the acoustical energy within the control room. The calculations evaluated the room volume, type of surface materials within the room and overall purpose to maximize the room's ability to provide high quality communication.

Acoustical Interior Design and Field Testing

Camp Pendleton, California

Assisted with the acoustical re-design and remodel of the marine corps recording studio facility at Camp Pendleton. Areas of primary responsibility included conducting elaborate and complex field testing of the common walls and interior spaces to determine the final overall acoustical performance of the facility; evaluating sound insulation properties of the common wall and window configuration separating the rehearsal rooms from the control room; evaluation and design of the interior acoustical reverberation environment within the two rehearsal rooms and the control room; design of the location and recommendation of the type of absorption material

needed to reduce the acoustical energy within the rehearsal rooms and control room; and following construction, conducting a series of complex acoustical field tests within the facility to determine its overall acoustical performance. The improvements now allow the Marine Corps band to create professional recordings for distribution to U.S. troops and patriots worldwide.

Traffic, Aircraft, and Railway Noise Studies

- Exterior Compliance Noise Evaluation
- Exterior-to-Interior Noise Compliance Evaluation
- Traffic and Railway Noise Contour Mapping
- Custom Residential Sound Wall and/or Interior Noise Control Designs
- Studies following CEQA Guidelines

Mechanical Noise and Vibration Impact Studies

- Mechanical Equipment Noise Issues
 - Exterior Property Line Impacts: HVAC Systems, Generators, Exhaust Fans, Water Towers
 - Interior Room Noise Control: Mechanical Rooms, Rooftop HVAC, Elevator Shafts
- Interior Ductwork Noise Transmission Evaluation: Offices, Classrooms, Churches, Conference Rooms

Window, Wall, and Floor/Ceiling Assembly Design Evaluations (STC/IIC)

- Theoretical STC and IIC of Proposed and/or Existing Construction Assemblies
 - Commercial and Residential Properties
 - Specific Acoustical Evaluation and Design Upgrade Protocol for Residential HOA CC&R's
- Field Testing for FSTC and FIIC Building Code Compliance
 - Real Estate Due Diligence Transaction Documentation
 - Commercial and Residential Design Remodel Upgrade Documentation
 - Generalized City, County, and State Building Code Compliance Testing
 - Interior Noise Impact Analysis to Exterior Noise Sensitive Receptors

Architectural Interior Room Performance Design and Recommendation Evaluations

- Theoretical Evaluation of Architectural Geometric Design
- Theoretical Evaluation of Surface Material Selection and Installation Design
- Theoretical Prediction of Acoustical Parameters Necessary for Interior Quality Environment
 - Reverberation Times and Rate of Decay
 - Speech Intelligibility Metrics
 - Musical Performance Venue Parameters
- Practical Field Applications and Design Recommendations
- Field Testing Existing Interior Room Acoustics for Reverberation Time (RT60)
 - Documentation and Measurements of Pre-Existing Acoustical Conditions
 - Documentation and Measurements of Post-Remodel Acoustical Conditions
- Field Installation and Administration Services
 - Oversee Design Material Installation and Placement per Acoustical Documentation